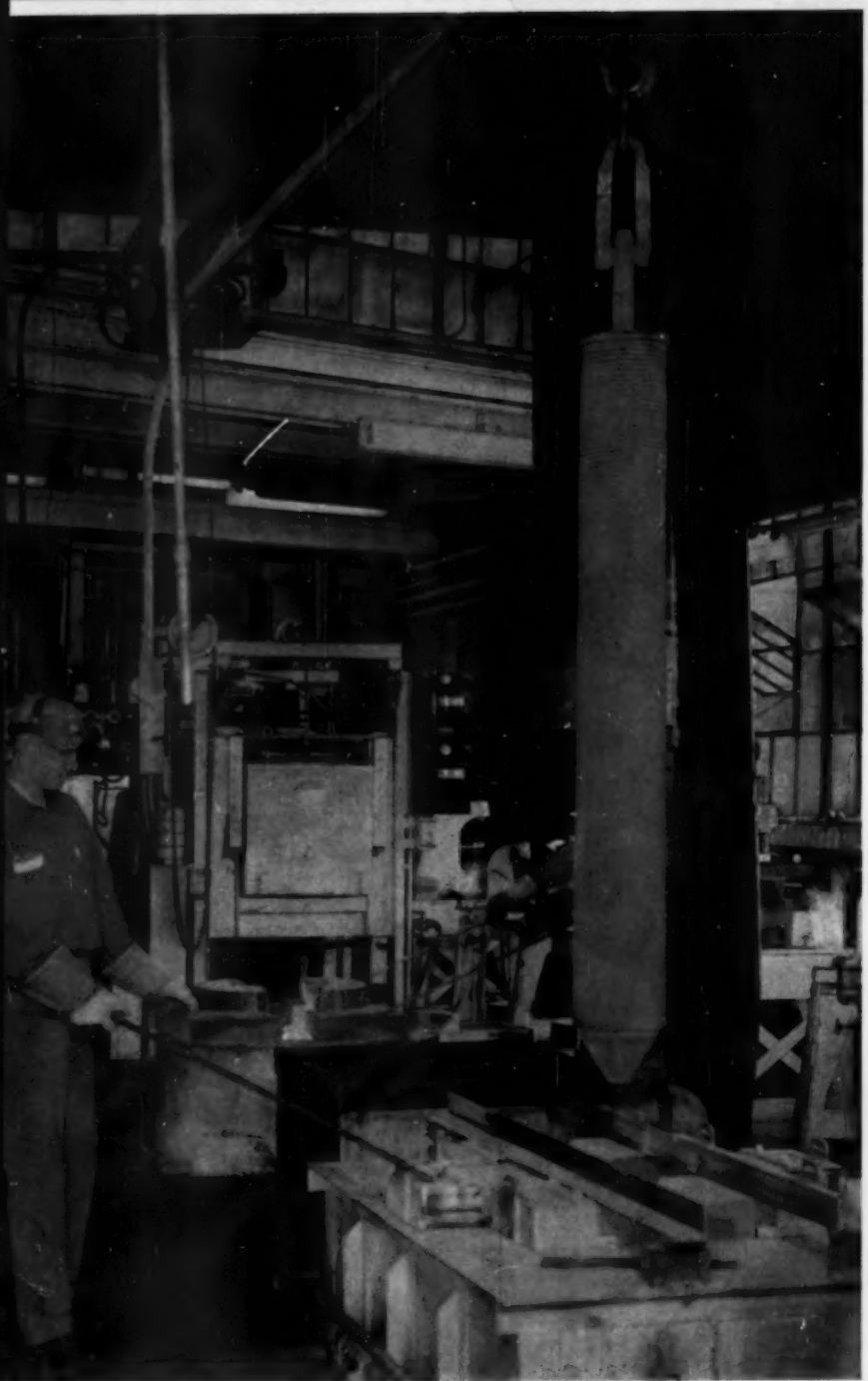
American Machinist

NOVEMBER 4, 1957 PRICE 75 CENTS

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Applied Numerical Contouring

A SPECIAL REPORT, page 145



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Q Where does Heald automation BEGIN

. . . and where does it END?

A *Wherever you want— from rough casting to finished part!*

THE EXTENT to which you apply automation in your plant is largely a matter of production economics. But whether your automated lineup consists of two stations or twenty, Heald can do the whole job from start to finish.

Perhaps, like some other men in metalworking management, you look upon Heald Bore-Matics as strictly high-precision machines that couldn't (or shouldn't) be used for *roughing* operations. Actually, Heald Bore-Matics can be and have been designed most successfully, to provide whatever degree of precision you need—from drilling, reaming, tapping, slotting, rough boring, turning and facing, etc., to any combination of precision-finishing operations.

To precision specialists roughing operations present no problems and, of course, the precision operations are taken in stride.

On any automated job, make it Heald all the way—from rough casting to precision-finished part.

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Sta. 1. Drill 6 angular holes and 2 opposed holes in hub.

Sta. 2. Bore, face, turn and chamfer 8 surfaces on flange and hub.

Sta. 3. Turn and face 9 different flange surfaces.

Sta. 4. Face 2 spots on flange.

Sta. 5. Bore, face and groove 5 different surfaces in hub and flange.

Sta. 6. Insert bronze bushing in inside hub.

Sta. 7. Finish bore bushing and finish turn hub.

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Subsidiary of The Cincinnati Milling Machine Co.

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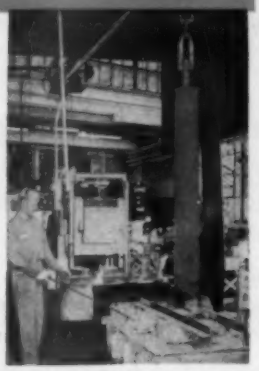

Auto Methods . . The auto industry has a built-in demand for new production ideas with its yearly model changes. Even when the changes are not too drastic, the fact that production lines will be shut down for a few weeks while new tooling is installed gives both an incentive and an opportunity to look for ways to make it better and cheaper that can be installed at the same time.

Early last summer, when final plans for the production changes were being worked out, Detroit Editor George De Groat was touring the auto plants and talking with manufacturing managers and master mechanics. From them he learned what the hottest new techniques on the '58 cars would be. As the new tooling was being installed, George was back again getting the details and the pictures for our series on production of the '58s.

First came the Edsel, and his story on that was in the mail to you the day the Edsels went on display in showrooms (*AM*—Sept 9 '57, p119). Next came the story on how General Motors applies integrated assembly machines (*AM*—Oct 7 '57, p105). This week you'll find George's reports on the best ideas from Buick, Chrysler, and Pontiac starting on page 129.

Production experience . . . Numerical control is still so new that most of the information, though extensive, is of a test nature. The nearest approach to actual production experience is probably the skin mill that Giddings & Lewis has used on commercial work for the past two years to gain experience with tape control. Many plants are about to have their first experience in applying tape control and any practical experience should be especially timely right now. So we asked Harry Ankeney and D H Bingham, Jr to give you the benefit of their application experience at G & L. You'll find it on page 145.

Coming . . . *AM* for November 18 will provide an unusual Special Report, "Metalworking: 1962." You may recall that at the time of our 75th Anniversary Issue in 1952 we made a 10-year forecast of metalworking. We asked a panel of specialists to take that forecast for 1962 and revise it. The results will provide a useful look ahead for everyone in metalworking. The Nov 18 issue will also contain a collection of timely articles and all the regular departments.

Cover . . .

A forged broach, 69 in. long is transferred from the preheat furnace to the high-heat furnace at National Broach and Machine Co. For further details see story on page 124.

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Helixform*—a new method for bevel gear production!

The new No. 112 Hypoid Helixform Gear Finisher assures improved quality and increased production on spiral bevel and hypoid non-generated ring gears up to 10½" in diameter, and 2½ DP such as employed in passenger car axles.

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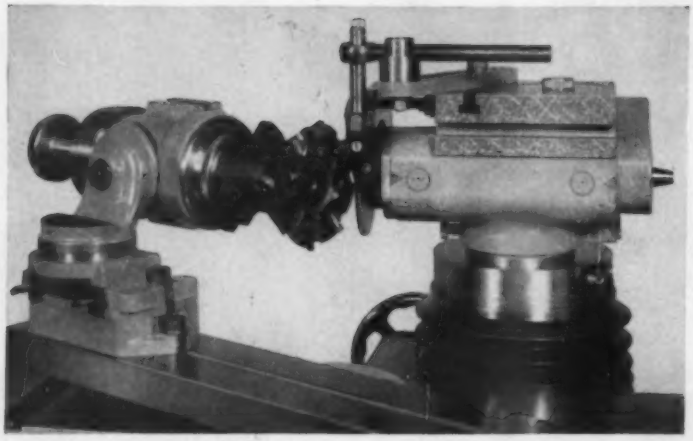

Angular cutters and large diameter saws are ground with the table disengaged from the conventional taper setting device and swiveled to any angle desired.

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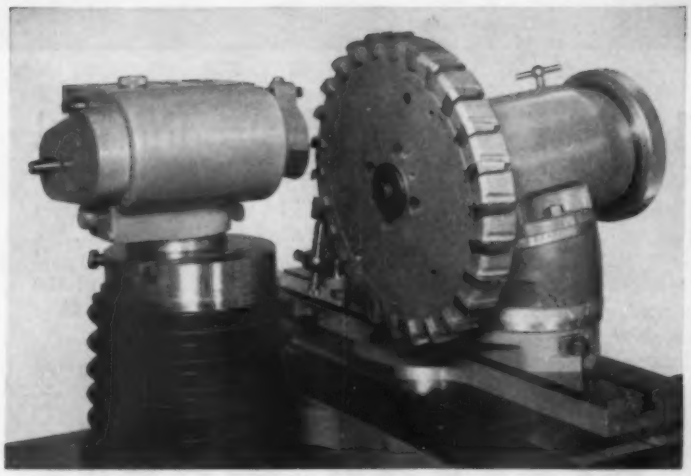
Taper reamers are a real test of cutter grinder performance. Smooth, anti-friction table traverse and FILMATIC grinding wheel spindle bearings are a big help in grinding reamers for high-quality, free-cutting action.



Heavy face milling cutters up to 18" diameter are mounted on the Face Mill Grinding Attachment for the complete grinding operation: face, diameter and corners.

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accurately grinds just about every cutter in the shop

. . . and quicker than you can read about it! CINCINNATI® No. 2's give you the opportunity to attain two desirable objectives in your cutter maintenance program: 1) Cutters of any size and type, ranging from small end mills no bigger than a pencil to heavy 18" diameter face mills, can easily be ground on these machines. 2) Cutters can be quickly and accurately restored to top cutting trim and a maximum volume-of-chips potential. ¶Check these advantages of CINCINNATI FILMATIC No. 2 Cutter and Tool Grinders against any other equipment within their range:

Anti-friction ball bearing table slide, with hardened and ground ways

FILMATIC grinding wheel spindle bearings have a life span of years

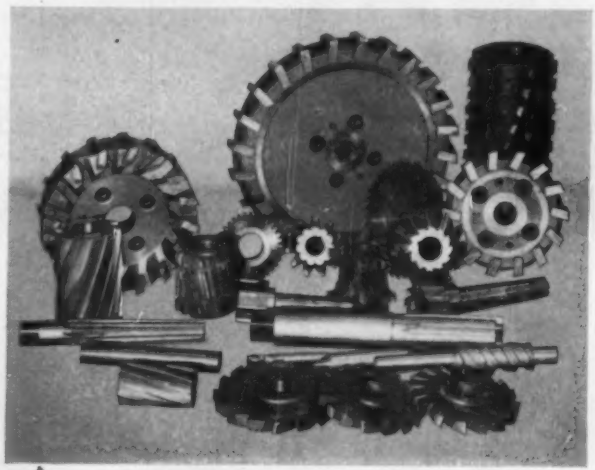
Four operating positions, with both mechanical and electrical controls at the operator's fingertips

Vertically adjustable wheelhead pile, with eccentrically mounted wheelhead to gain extra range

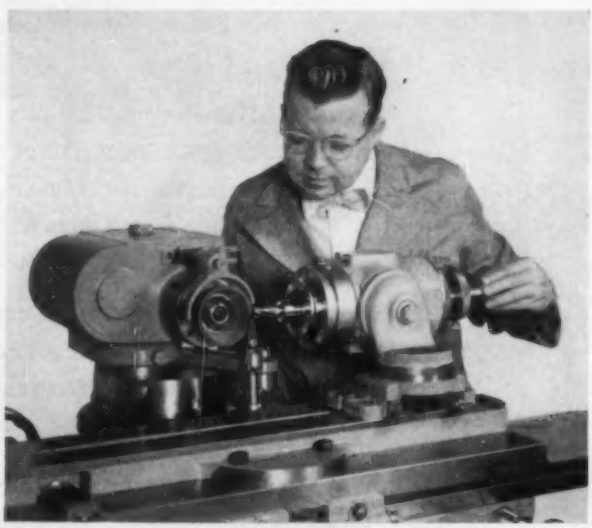
There are many other reasons why you should choose Cincinnati for all your cutter grinding requirements. A few are outlined in Sweet's Machine Tool File. More information in catalog No. M-1914-2. May we send a copy to you?

THE CINCINNATI MILLING MACHINE CO
CINCINNATI 9, OHIO

CINCINNATI FILMATIC
No. 2 Cutter and Tool Grinder
Catalog No. M-2004



Wide range and variety of cutting tools which may be ground on a CINCINNATI FILMATIC No. 2 Cutter and Tool Grinder.



Small end mills are ground with the aid of the Small End Mill Grinding Attachment, usually with the operator seated at one of the two rear operating stations.

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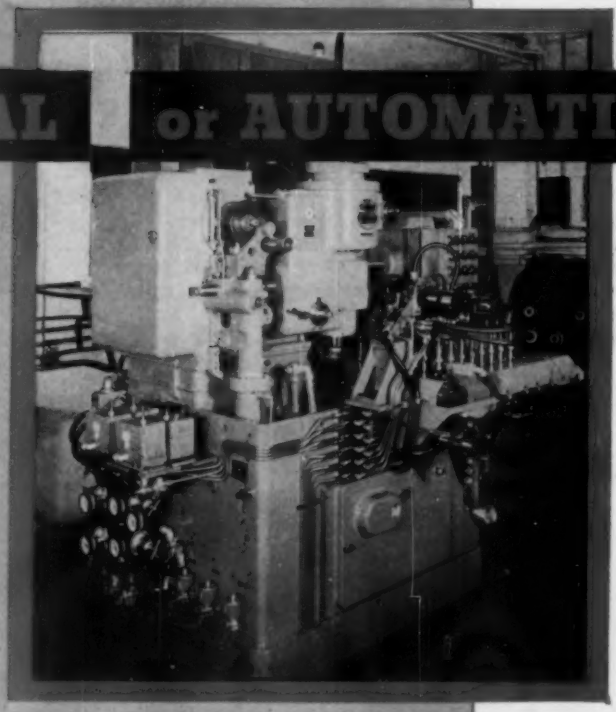

Practically any shaped part in its size range can be cut faster and more accurately on a Fellows No. 4GS Gear Shaper . . . with either manual, semi-automatic or full-automatic operation, depending on your needs!

This production flexibility makes the powerful "4GS" ideal for long runs on similar parts or for short runs of varied jobs. Set-ups are easy and fast. Internal or external spur and helical gears, as well as splines, cams and other irregular non-involute shapes up to 6" P.D. and 2" face width can be cut on this machine. Nine cutter speeds range from 98 to 635 strokes per minute.

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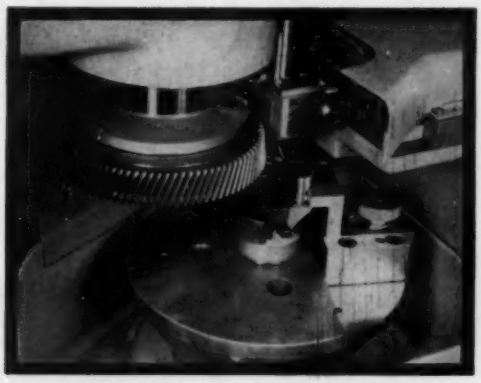
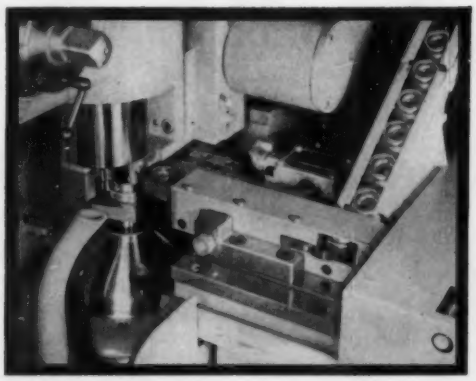
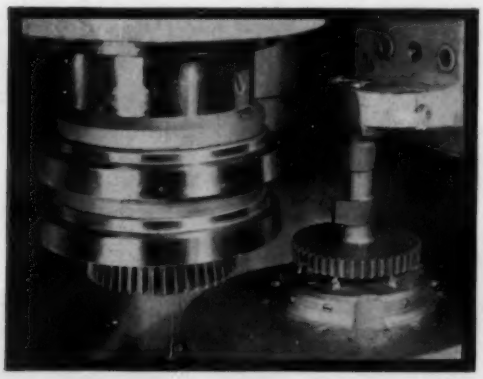
...or anything in between!



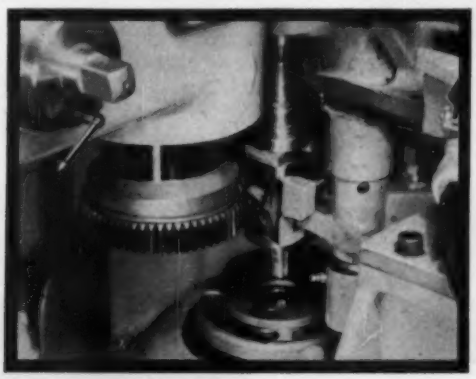
Helical gear cut on a motor crankshaft. Operation can be manual or semi-automatic. Part is held in a bushing at the bottom, an air operated split sleeve support at the top and driven from the connecting rod bearing surface.



Internal clutch parts produced with fully automatic loading and unloading. Part is transferred from loading chute to air operated expanding arbor and teeth are cut. Part is then removed from arbor and transferred to unloading chute while another blank is being loaded.



Two cams and a gear are cut at the same time on this gasoline motor part. Cutters are used in tandem and are keyed together to give the required relation between the positions of the cams and the teeth of the concentric gear. Operation is manual.



Automotive transmission cluster gear shaft handled automatically. Air operated "fingers" move shaft into position for automatic chucking and then place finished part in unloading conveyor.

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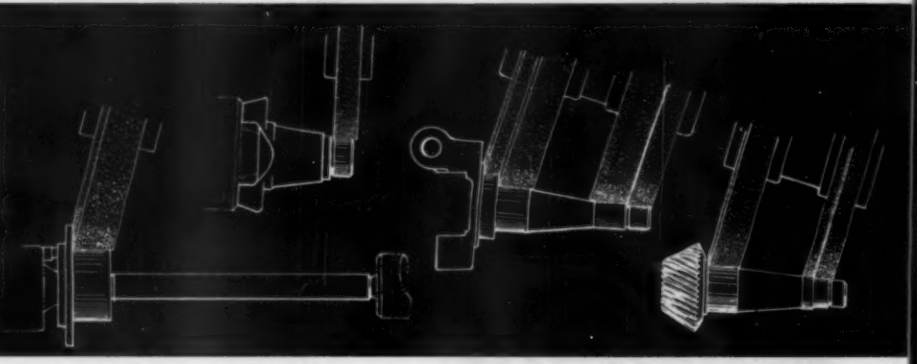

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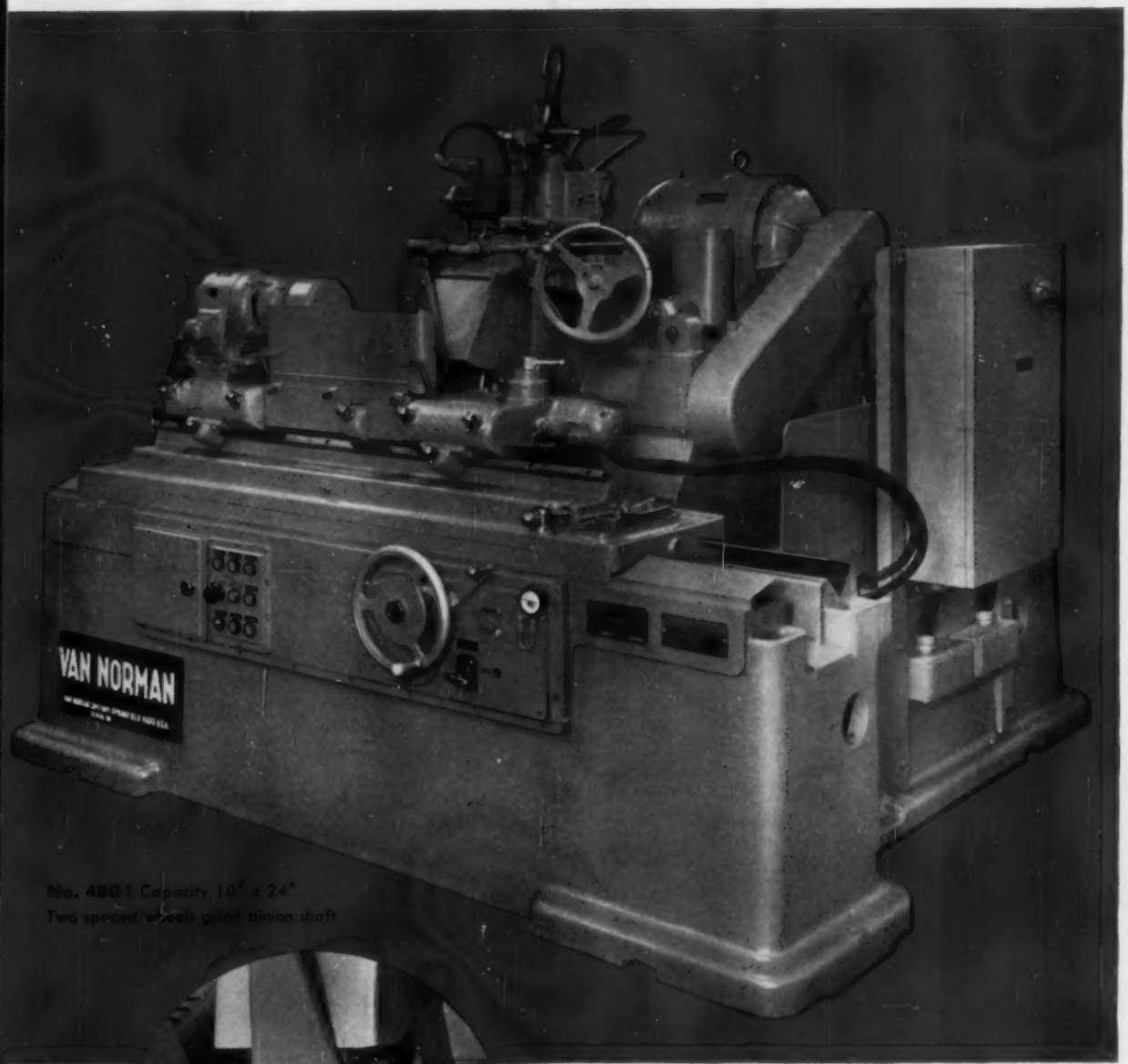
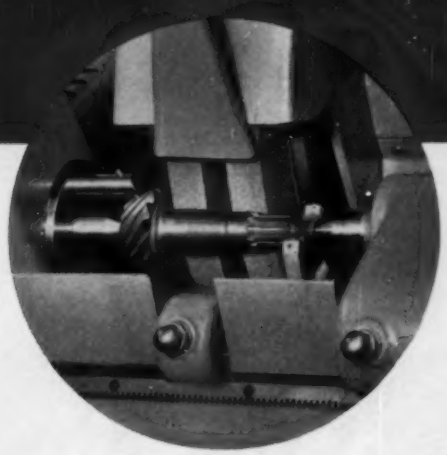


No. 4801 Capacity 10" x 24"
Two spindle wheels grind pinion shaft



Don't wait . . . for extra profits install a Van Norman Machine now! They are available on many purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . up to 10 years . . . See your dealer or write Van Norman Machine Company.

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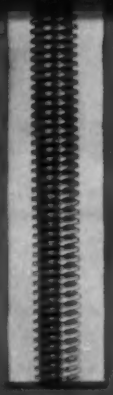
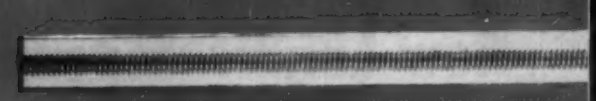
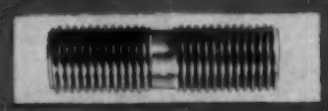
Additional information on request—please send specifications and ask for Bulletin E-60.



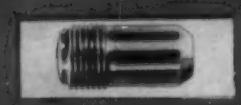
WORKPIECE: Jack Screw
MATERIAL: C1018 Steel
THREAD SPECIFICATIONS: 1"-5 pitch 29° Acme
TOLERANCE: Class 4C
METHOD: Thrufeed Rolling
PRODUCTION: 30" per minute (rolled in 36" lengths—can be rolled in 12' lengths)



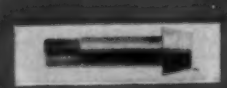
WORKPIECE: Timer Switch Leadscrew
MATERIAL: B1112 and C1117 Steel
THREAD SPECIFICATIONS: ¼"-16 Pitch Standard Acme
TOLERANCE: Class 3G
METHOD: Thrufeed Rolling
PRODUCTION: 46" per minute (rolled in 18" lengths—can be rolled in 12' lengths)



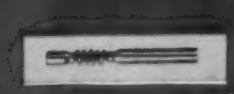
WORKPIECE: Double-End Stud
MATERIAL: C1040 and SAE 8620 Steel
THREAD SPECIFICATIONS: 2"-4½ pitch NC—3" thread length
TOLERANCE: Class 3
METHOD: Infeed Rolling (manual loading)
PRODUCTION: 1½ min. rolling time per piece (both ends)



WORKPIECE: Barrel—MG Gun Perforator
MATERIAL: .60 Carb. Silicon Tool Stl.
THREAD SPECIFICATIONS: 1⅞"-6 pitch Stub Acme—1" thread length
TOLERANCE: Class 3G
METHOD: Infeed Rolling (hand-operated work-holding fixture)
PRODUCTION: 15 pieces per minute



WORKPIECE: Aircraft Bolt
MATERIAL: 4340 Steel of 36-40 Rockwell C
THREAD SPECIFICATIONS: 1"-14 pitch NF—1-5/16" thread length
TOLERANCE: Class 3A (Military Spec. MIL-S-7838-A)
METHOD: Infeed Rolling (manual loading)
PRODUCTION: 10 pieces per minute



WORKPIECE: Transfer Drive Worm
MATERIAL: Stainless Steel
THREAD SPECIFICATIONS: ¼"-26 diametral pitch, left hand, single—⅜" thread length
TOLERANCE: .1825—.1805 P.D.
METHOD: Infeed Rolling (manual loading)
PRODUCTION: 20 pieces per minute

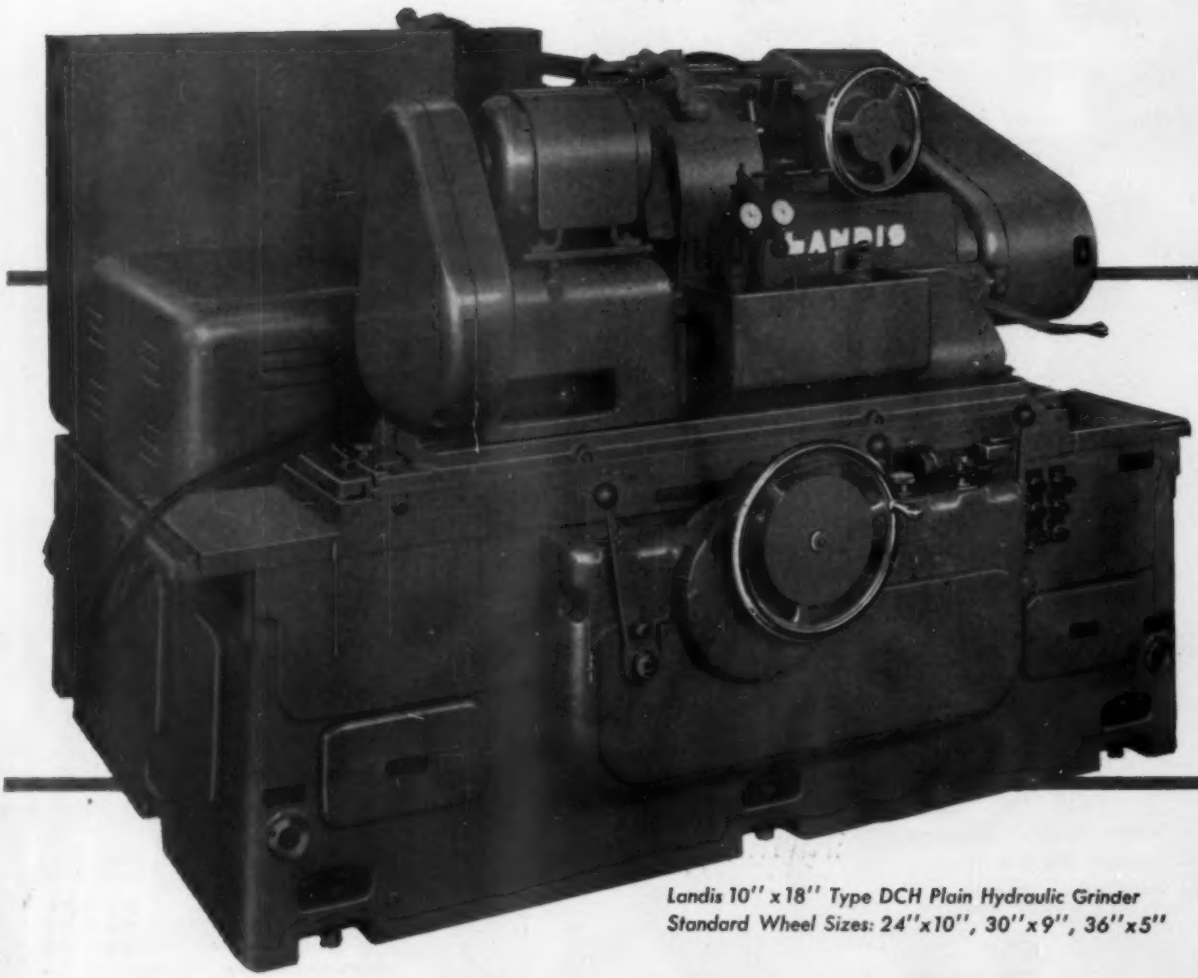
LANDIS Machine COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

New Landis wide wheel heavy duty grinder

. . . on these jobs

1. **Profile grinding**
2. **Wide wheel infeed grinding . . .** makes one operation of jobs formerly requiring two or more
3. **Spaced wheels infeed grinding . . .** finishes several diameters at one time



Landis 10" x 18" Type DCH Plain Hydraulic Grinder
Standard Wheel Sizes: 24"x10", 30"x9", 36"x5"

LANDIS
precision grinders

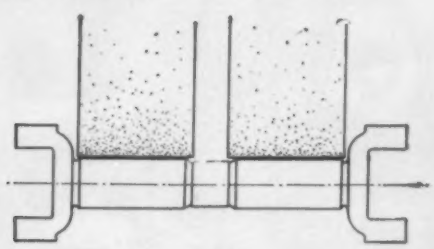
Landis type DCH plain grinder design features
Heavy duty wheel spindle and microsphere bearings
20 hp wheel drive motor
10" or 14" machine swing
1½ hp work drive motor

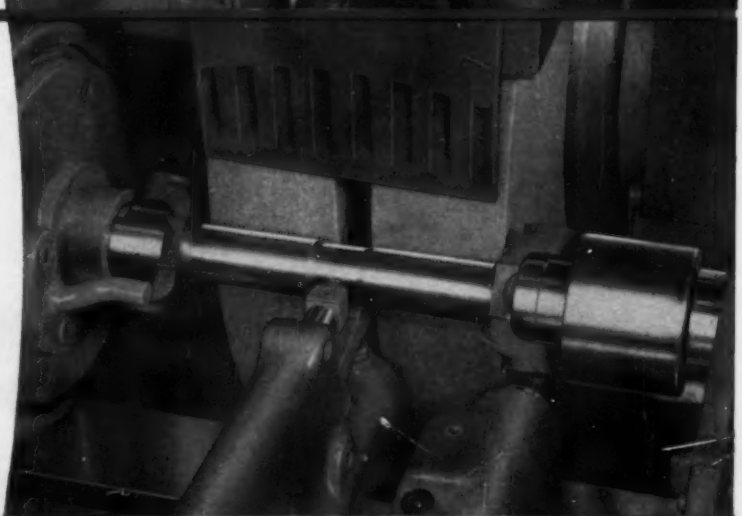
LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

combines operations, lowers costs

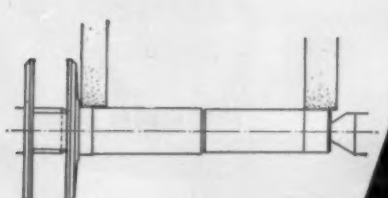
Profile grinding two diameters of a motor shaft in one operation using an 8" wide wheel.

Infeed grinding diameters of propeller shaft sleeve yokes on one arbor. Multiple table-type diamond dressing.

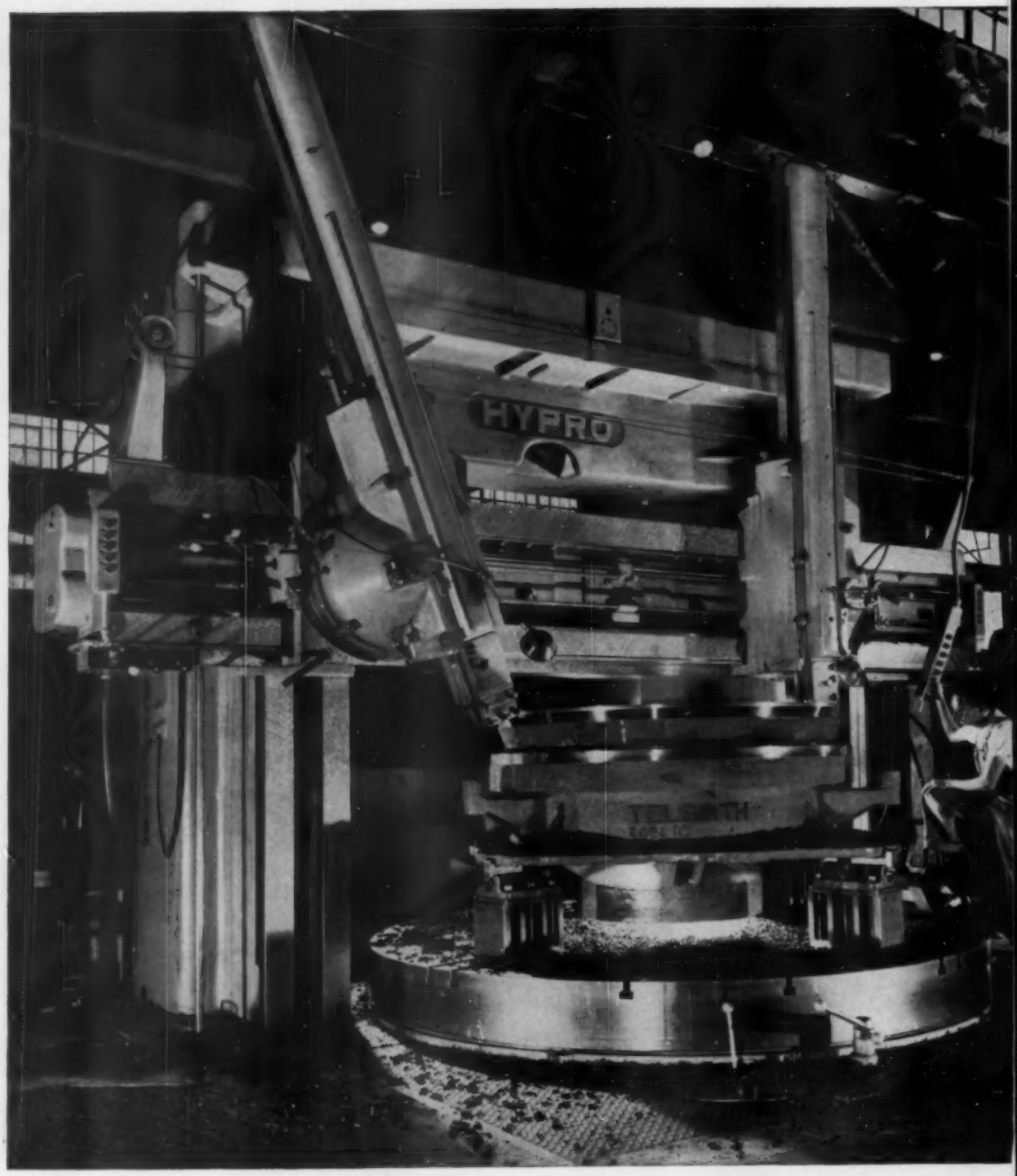




Widely spaced wheels finish two diameters and one adjoining face of transmission output shaft.



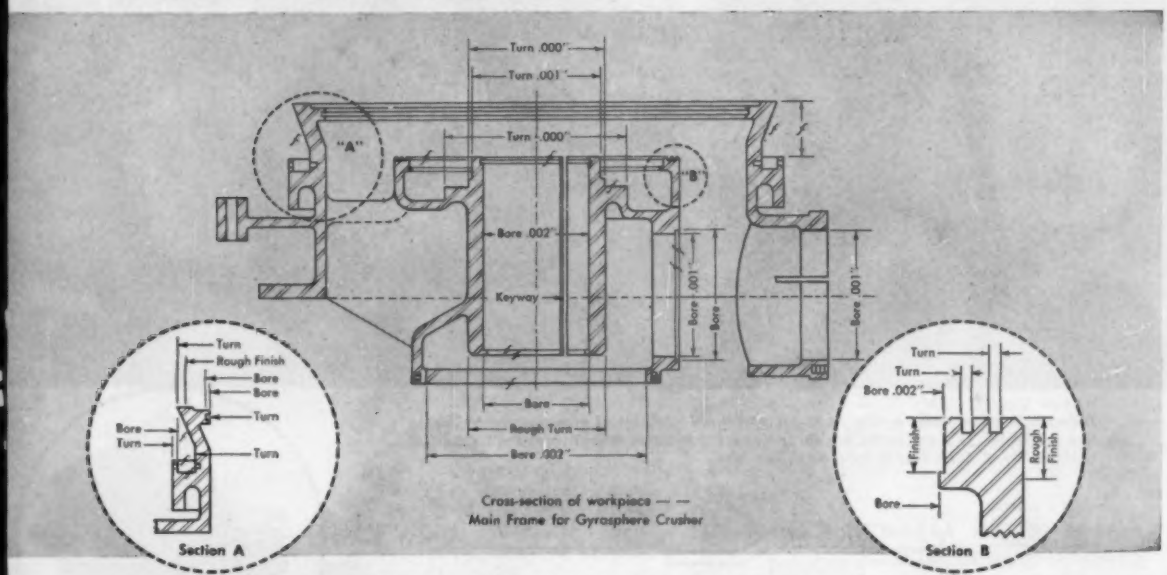
20 precision turning



and boring operations

.000" to -.002" tolerances

That's what Smith Engineering gets with a Giddings & Lewis 10-ft. Hypro Vertical Mill, machining 5½-ton, all-steel Gyrasphere main crusher frames



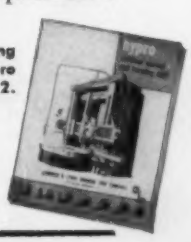
HERE'S another Giddings & Lewis' masterpiece of precision in action. It's a 10-ft. Hypro Vertical Boring and Turning mill that's on the job every day at the Smith Engineering Works, Milwaukee. Extremely versatile and accurate, this boring mill turns and bores 20 different diameters on the hi-carbon, cast-steel main crusher frame — 7-ft. wide, 3'4½" high, weighing 5½ tons. Inside and outside diameters at different height are machined to precise tolerances — .000" to −.002".

There's a good reason for this kind of precision performance. You'll find it in G&L's advanced design and operating features, such as non-metallic ram and saddle bearings that resist abrasive action of metal dust and forging scale, residual heat, etc. No more chatter, cutter breakage and vibration so harmful to precision machining.

G&L Hypro Vertical Boring and Turning mills are available with an electronic tracer control system, plus a wide range of optional operating features. They're built in 12 standard models with capacities ranging from 54" to 12'.

Remember, if you're considering buying a new vertical boring mill, it will be profitable for you to get in touch with your G&L representative today, or write direct to factory.

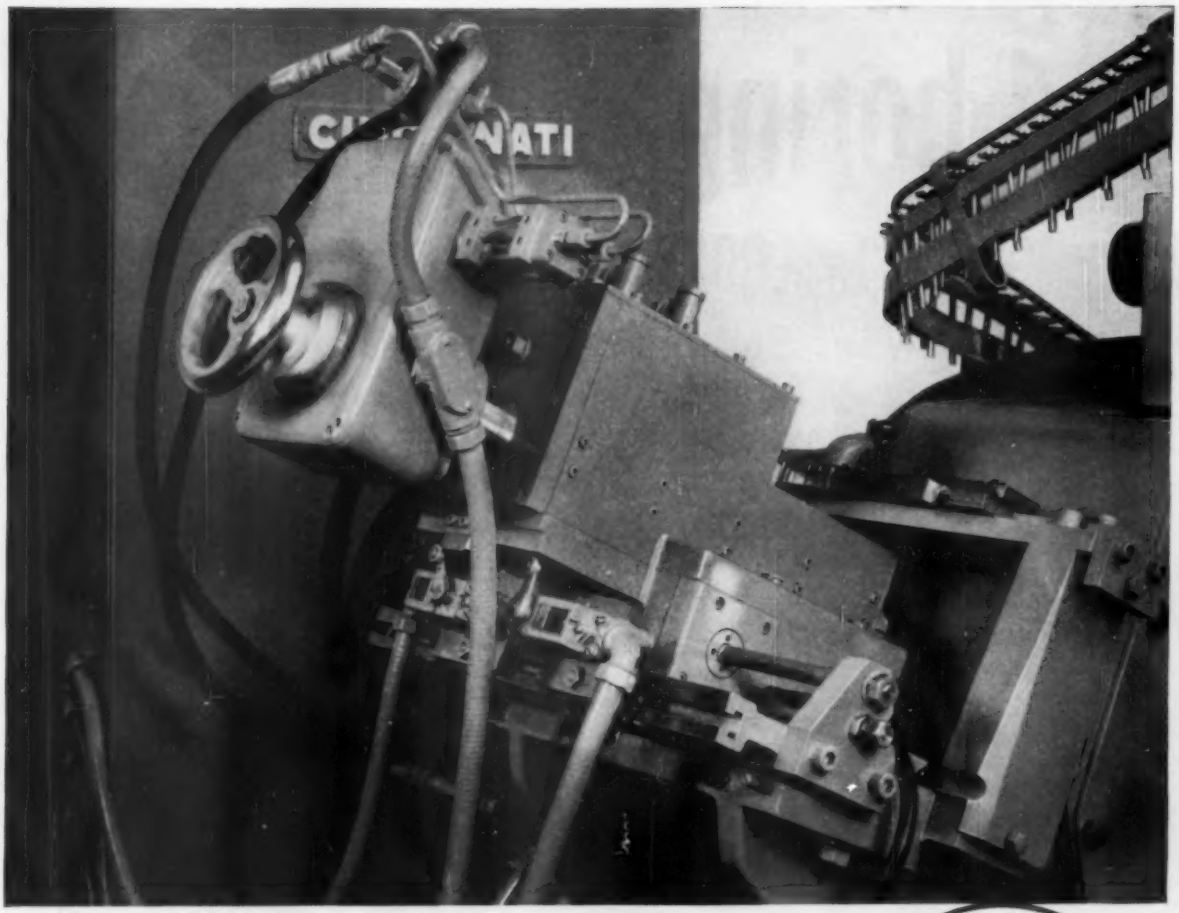
Write for this 42-page catalog, describing and illustrating G&L's broad line of Hypro Vertical mills. Ask for Catalog No. 54-12.



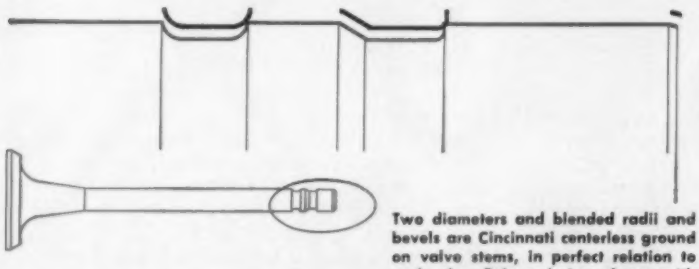
G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

G-62

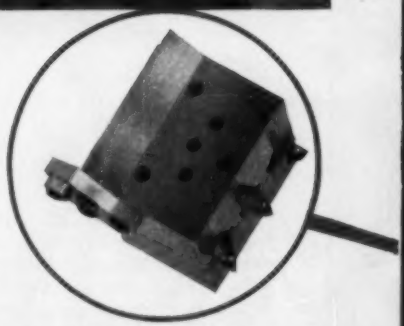
Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines, Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Machines.



Truing unit incorporates a new approach to an old problem of stopping production to true the wheel. This unit is the key to continuous productive operation of the CINCINNATI FILMATIC No. 2 Centerless Grinder described here.



Two diameters and blended radii and bevels are Cincinnati centerless ground on valve stems, in perfect relation to each other. Enlarged view above, with ground diameters indicated in black. Production at the rate of 18 parts per minute.



Three-diamond truing holder is easily removed and replaced with a spare. This unit is part of the cost-reducing equipment supplied with the CINCINNATI FILMATIC No. 2 Automatic Centerless Grinder at the right. Standard machine catalog No. G-644-3. Write for a copy.

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE

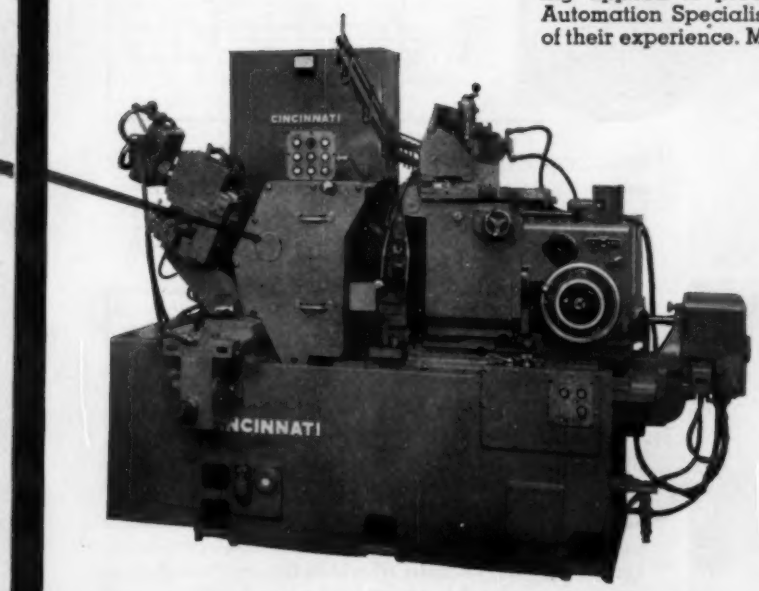
No "TRUING BREAK" required ... Cincinnati Filmatic Centerless automatically trues the wheel while grinding!

Taking time out for periodic truing operations is usually an accepted break in precision grinding production. But for rapid, automatic cycles, the break is very expensive. Cincinnati Grinding and Automation Specialists figured out a way to eliminate this drag on production for the operation of grinding the grooves, adjacent radii and chamfer on valve stems.

The grinding wheel is automatically trued while the machine is producing

The parts are ground on a CINCINNATI® FILMATIC No 2 Centerless, equipped for automatic production with the following features: cammed regulating wheel . . . air operated automatic loading fixture . . . automatic profile booster type truing unit for the grinding wheel incorporating counting device . . . automatic compensation for amount trued off the wheels. ¶The truing unit is the key to the entire production idea. Two three-diamond tool holders are supplied, and nibs are pre-set to exact relationship on an optical comparator. When diamond wear affects accuracy, the holder can readily be replaced with the spare. The truing cam (made of sintered carbide) is designed so that each diamond performs its task and is out of the way before the next contacts the wheel. Accuracy of the radii and bevels, and spacing of the grooves, are very critical, while diameter is not so critical as to be affected by the in-process truing operation. ¶This precision grinding equipment is typical of the advanced thinking applied to production problems by Cincinnati Grinding and Automation Specialists. These men are ready to give you the benefit of their experience. May we hear from you?

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



CINCINNATI

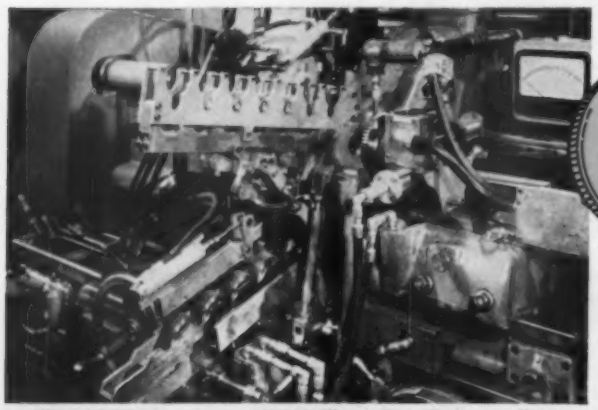
FILMATIC

GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

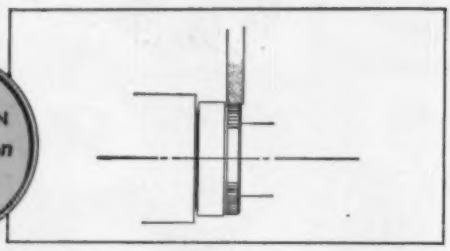
The more you grind the more you save with Norton...

cost-cutting automatic operations

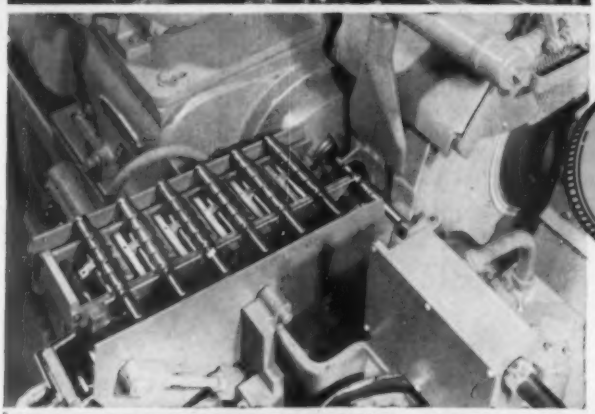
Typical automatic features on Norton grinders



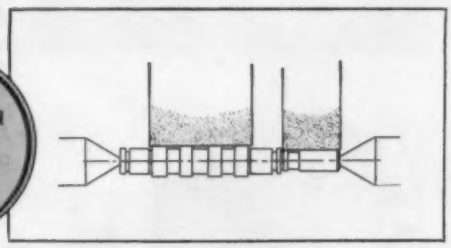
SAVINGS ON *Transmission Gears*



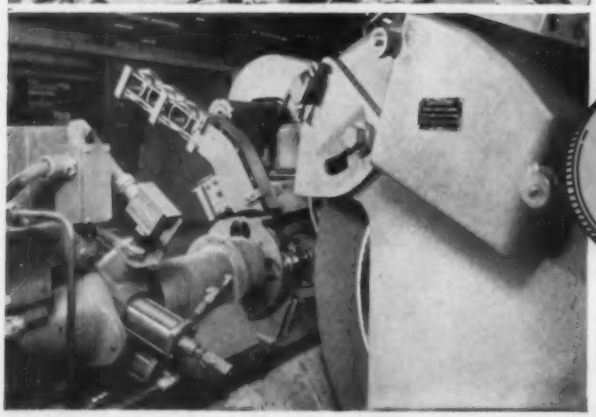
In a Type CTU Cylindrical Grinder arranged for completely automatic loading, grinding, and unloading of transmission gears, the part is held on a chuck and grinding cycle is terminated by an automatic air-electric grinding gage that signals when work is to size.



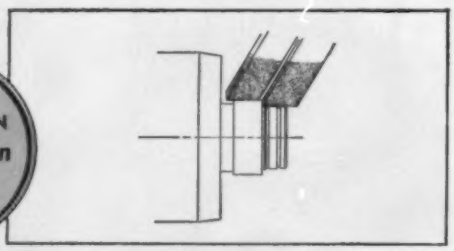
SAVINGS ON *Valve Pistons*



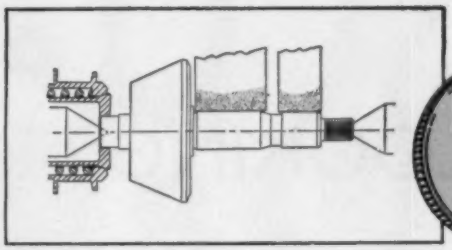
When a Type CTU Grinder is arranged for fully automatic loading and grinding of valve pistons the part is held on centers and driven by a floating type collet. Work is ground by a double-wheel mount.



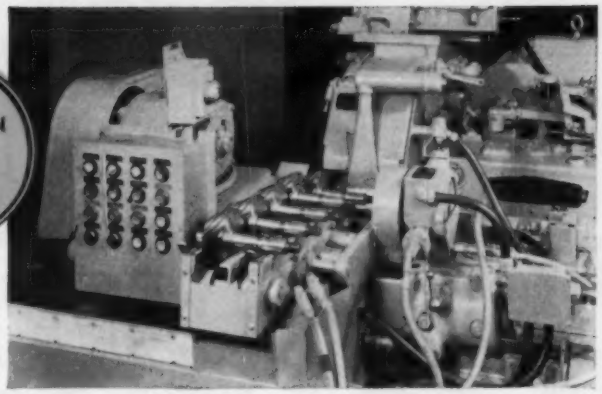
SAVINGS ON *Transmission Sleeves*



On this Type CV-4 Angular Wheelslide Grinder chucked grinding of transmission sleeves is arranged in a completely automatic cycle. Longitudinal movement of a revolving turret loads the machine. A stripper type plate removes the piece when turret retracts as the grind is terminated by electrically timed control.



SAVINGS ON *Stem Pinions*



The Stem Pinion Grinder reduces time and effort with a completely automatic cycle, electrically timed arrangement for grinding these hard-to-handle parts. Progressive escapements in the automatic loading mechanism release the parts in succession, avoiding gear mesh.

NEW ECONOMY!

Norton No. 2 Unitized Transfer Grinder Grinds Crankpins Automatically

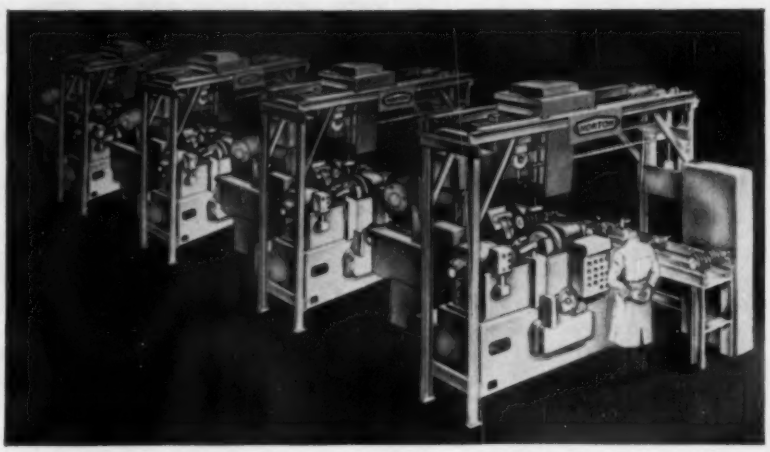
Here's a newly developed machine that automatically grinds crankpins faster and for less money than ever before possible. Advanced features like the following are reasons why:

Unitized Operation. Each grinding station, operating independently, can be automatically by-passed without affecting continuous production.

New Transfer Mechanism. Double set of hooks speeds loading, unloading and transferring of crankshafts from one grinding unit to another.

Fast Production. Cycling grinds 240 crankpins on 60 V-8 crankshafts per hour, due to many automatic operations.

Only One Operator Needed. Others are freed for different jobs. And the machine reduces floor-space requirements.



Norton has developed a wide range of fast, automatic grinders. You can get them in conventional and angular wheelslide types — also in special types for grinding automotive valve faces and crankshaft pins.

Remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost.

For further information about these machines — including how the No. 2 Unitized Transfer Crankpin Grinder can save you many dollars daily — contact your Norton Representative. Or write to NORTON COMPANY, Machine Division, Worcester 6, Mass.

District Offices:
Worcester • Hartford • Cleveland • Chicago • Detroit

To Economize, Modernize with NEW

NORTON

GRINDERS and LAPPERS

Making better products... to make your products better

NORTON PRODUCTS:
Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING DIVISION:
Coated Abrasives • Sharpening Stones • Behr-cat Tapes

Are you SURE you are not OVERLOOKING the lower costs that are possible with

PRECISIONAIRE AIR GAGING?

It costs you nothing to find out. Our field and factory engineers will gladly consult with your organization without obligation.

Or—Why not investigate our monthly Manufacture and Measurement Clinics where your supervisory people can SEE FOR THEMSELVES.

For detailed information on Air Gaging, write to THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A., Dept. 1.

the SHEFFIELD corporation

precision measurement for mankind

of Bendix Aviation Corporation

BH Bond cuts grinding costs in rough snagging operations

Gardner's new BH Bond gives:

longer disc life
BH Bond is tougher, more heat-resistant

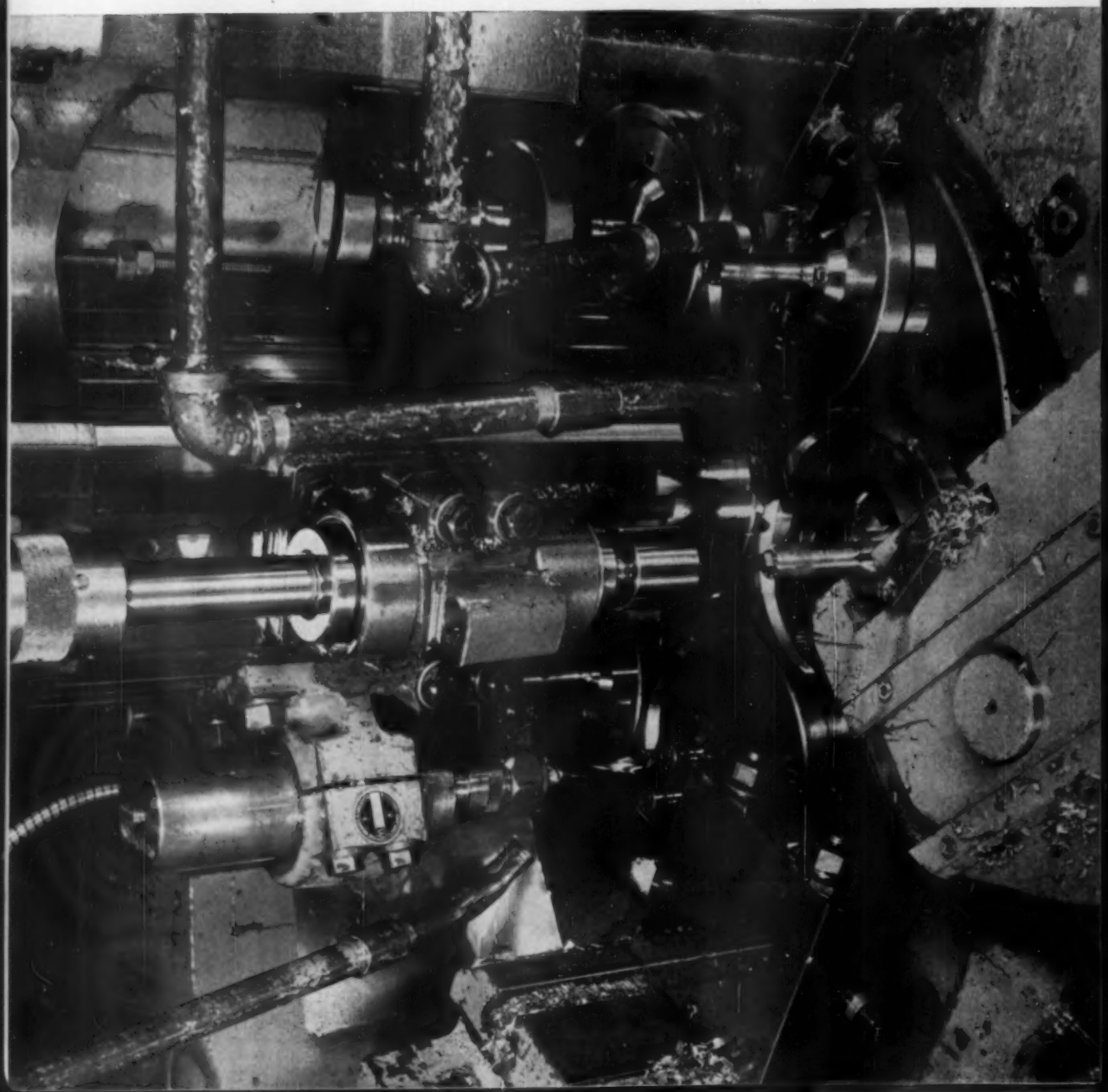
higher production
eliminates frequent disc changing

greater efficiency
more production per disc

BH Bond can be supplied in all standard disc sizes

GARDNER
abrasive discs
BELOIT, WISCONSIN

At Porter-Cable Machine Company..



6-Spindle Automatic

saves $12,700 on this one job!

A savings of over 7½¢ was realized on each of these small brass Brush Holder Bodies for electric motors when this formerly subcontracted work was handled on one of their 1¼" Warner & Swaseys.

Porter-Cable of Syracuse, N. Y., veteran producer of wood-working tools and powered garden equipment, reports through their Chief Manufacturing Engineer, Charles Allen:

"Our two Warner & Swasey 6-Spindle quick setup Automatics have an important place in our cost-reduction program. They consistently turn out the highly accurate parts our products require, saving us money on jobs that run in lot sizes from a few hundred to many thousand pieces."

Here's what Warner & Swasey 6-Spindle Automatics did for Porter-Cable Company:

- **ACCURACY**—Tolerances of plus or minus .001" easily held, maintaining high product quality.
- **SAVINGS**—Second operations were eliminated—handled complex work formerly subcontracted.
- **FAST SETUP—SMALL LOTS**—Jobs previously run on hand screw machines now more efficiently handled on the Automatics.
- **VERSATILITY**—Machining of tougher materials, parts with threads at each end, multiple diameters, broached holes are all now routine operations.

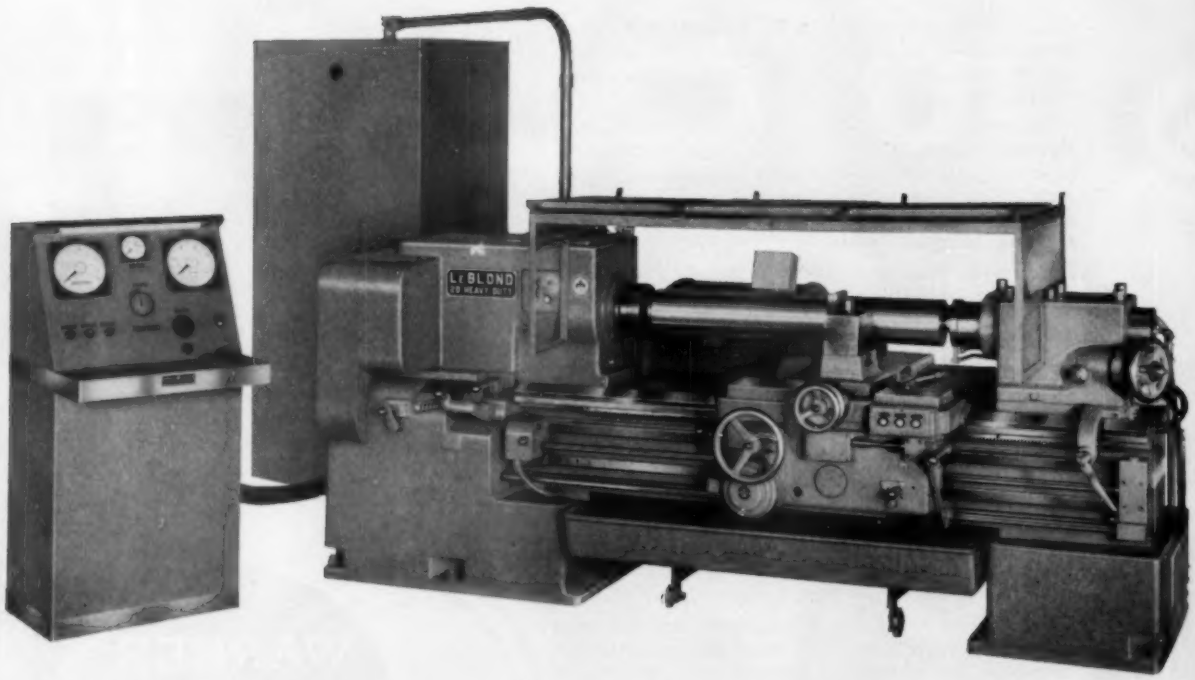
Why not have our Field Engineers evaluate your operations with a view to highlighting jobs that could be more profitably machined on modern Warner & Swasey Multi-Spindle Automatics? He's as near as your phone—call him today!

The rugged Speedmatic Belt Sander—only one of Porter-Cable's quality products.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

You can produce it better, faster, for less . . . with a Warner & Swasey

This 150 H. P. LeBlond lathe



Special LeBlond 20" uses 150 hp motor, provides infinite speeds from 250 to 5000 rpm, 90 feeds from .002 to .136. Special bearings in head and tailstock are cooled and lubricated by pressurized oil circulating system; common oil reservoir is temperature controlled by a thermostatic heat exchanger. Remote-control station includes: motor-generator start and stop, spindle start and stop, length and cross feed engage and disengage, horsepower meter, spindle speed indicator, cutting speed indicator, spindle speed control, overload lights and timer.

To test new cutting media and tools to their limits, General Electric's Metallurgical Products Department (manufacturers of Carboloy cemented carbides) required a faster, more powerful lathe than any available. This high speed LeBlond 20" lathe was developed for this purpose. It will rev up to 5,000 r.p.m., make efficient use of its 150 h.p. and permit a 50% overload for short periods.

LeBlond lathes are noted for their inherent stamina and rigidity. In this case it was only necessary to make modifications in the headstock, tailstock spindle and controls—the rest of LeBlond's Heavy Duty 20" was already powerful enough to take the new high loads.

Just what will this lathe do? The following test data tell the story:

tests tools for tomorrow

WORKPIECE—SAE 1045, 180 Brinell, 48" long.
TOOL—CEMENTED OXIDE 0 - 30.

TEST DATA

Test **1**
Workpiece diameter, 7.65". 5000 rpm 10,000 sfm
.010 feed. Carriage travel, 50" per minute over entire
workpiece .110 depth of cut. 138 hp consumed

Test **2**
Workpiece diameter, 6.65". 4300 rpm 7500 sfm
.010 feed. Carriage travel, 43" per minute over entire
workpiece .110 depth of cut. 105 hp consumed

Test **3**
Workpiece diameter, 6". 5000 rpm 7800 sfm
.015 feed. Carriage travel, 75" per minute
.100 depth of cut. 148 hp consumed

* 113.6 miles per hour!

Perhaps you've been looking for a lathe with this kind of power and speed. Maybe you have another special turning problem with which LeBlond could help. Or you simply need a good dependable engine lathe. In any case, you can call on LeBlond with confidence. See your nearby LeBlond Distributor or write—

. . . cut with confidence

THE R. K. LEBLOND MACHINE TOOL COMPANY
Cincinnati 8, Ohio

LEBLOND of Cincinnati

World's Largest Builders of a Complete Line of Lathes for More Than 70 Years

←------ The equivalent of a 15" wide broaching cut,

is made in one pass by LAPOINTE

the periphery of this PLANET RING GEAR

If this ring had been milled instead of Lapointe-Broached, it's a certainty that the production rate could never have reached the present high figure of one every 20 seconds, *175 complete parts per hour!*

Note the broaching sequence and see how *automation helps out,* as applied to this efficient Lapointe-Broaching Machine: Parts handling is completely mechanized . . . a belt conveyor moves the blanks onto a loading platform, a cylinder pushes a blank into a magazine, and a shuttle table carries the blank from the magazine into position for broaching. Then a push bar forces the blank through the broach pot (see photo) and an ejector cylinder pushes the finished part onto an unloading chute which connects with another belt conveyor to carry away the part.

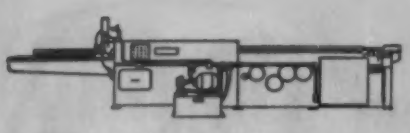
Direct-line . . . simple . . . easy, by Lapointe Broaching: the modern method of fast *metal-removal.* We believe a qualified Lapointe Field Engineer can help you to economize — substantially — on some of your own machining operations. Why not invite him in for a discussion?

THE LAPOINTE MACHINE TOOL COMPANY

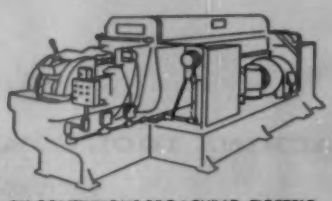
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

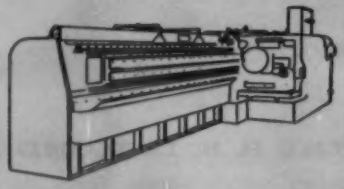
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC

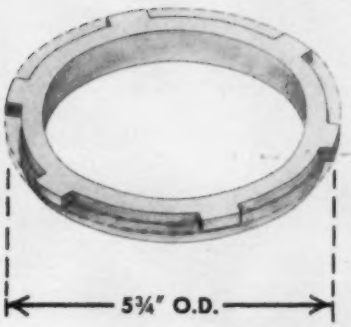


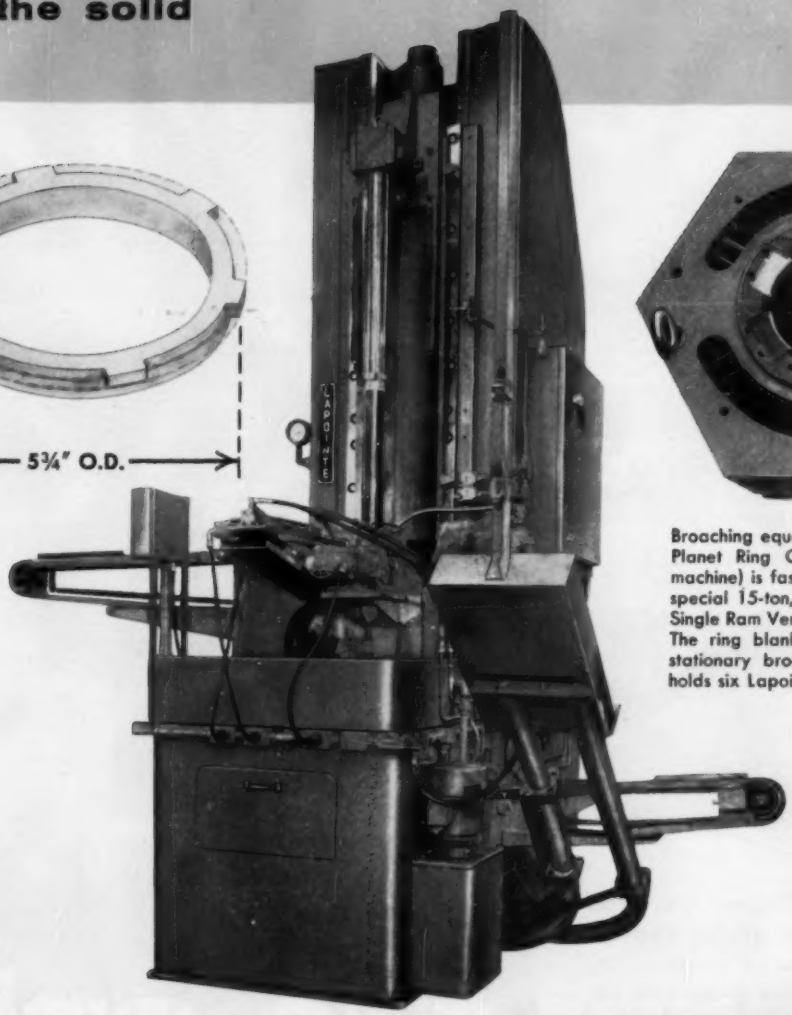
SRHE SINGLE RAM HORIZONTAL, ELECTRIC

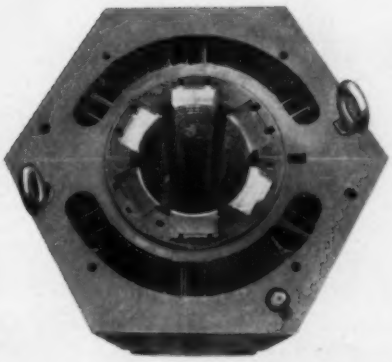
5/32" deep, (full width of this advertisement) ----->

— BROACHING

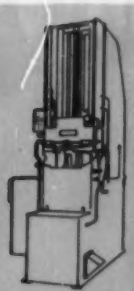
from the solid



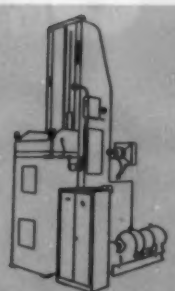




Broaching equally spaced tangs on the Planet Ring Gear (shown at left of machine) is fast and economical on this special 15-ton, 66-inch stroke Lapointe Single Ram Vertical Broaching Machine. The ring blank is pushed through the stationary broach pot (above), which holds six Lapointe-built broaches.



VUE-7 VERTICAL PULL-UP ELECTRIC



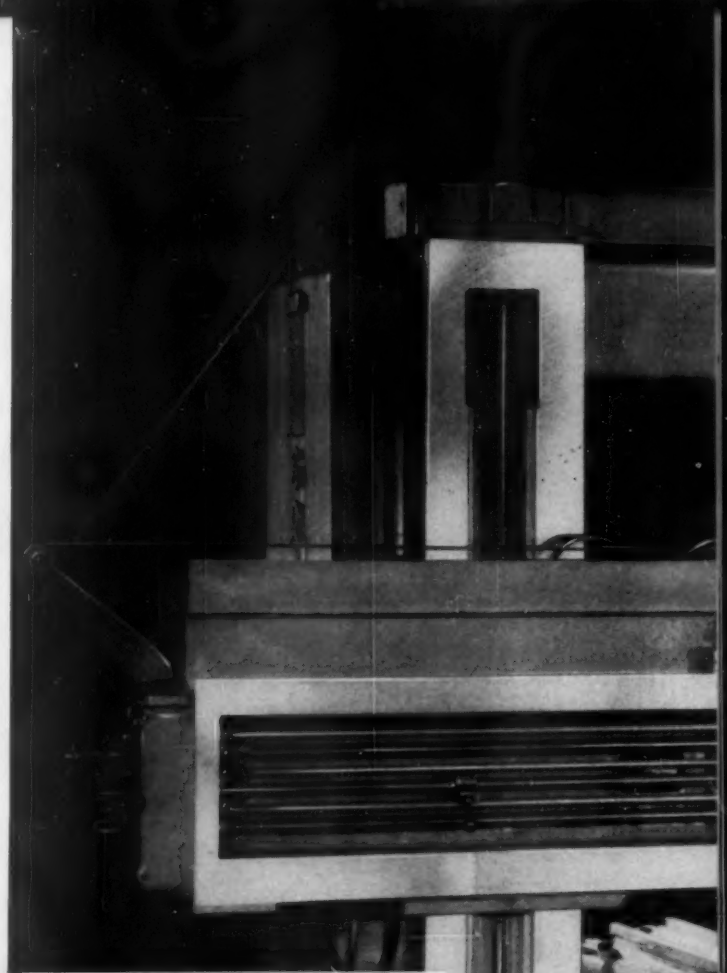
SERVE SINGLE RAM VERTICAL, ELECTRIC

DERVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING



heavy-duty planing

The Gray Universal is the world's most powerful planer available for conventional planing. Its rigidity and speed are ideally suited for modern carbide cutting.

double-cutting

The flick of a lever, the touch of a button permits double-cutting. Elimination of the idle stroke insures the world's most efficient flat surface machining. Only simple carbide tools are required.

triple-cutting

Rough and rough-finish plane at the same time. Rough by double-cut planing and simultaneously rough-finish with a single point tool. Then finish plane without a tool change.

cross planing

Eliminates extra settings by cross planing the occasional keyways, chamfered corners, and other troublesome small cross surfaces that formerly added hours to your set-up time.

a GRAY

This new 84" x 60" x 18' Gray Universal Planer shown in operation at the Koppers Co., cuts going - cuts coming, removes big chips at double rate. There is no idle return stroke to waste precious production hours. Instantaneous reversals with heavy duty double-cutting make this the first REAL new development in modern planers ...*a GRAY exclusive.*

Double tables further virtually eliminate the costly set-up time required by ordinary planers.

The multiple savings received by users of the new Gray Universal make it a wise investment.

If it's new... it must be a GRAY.

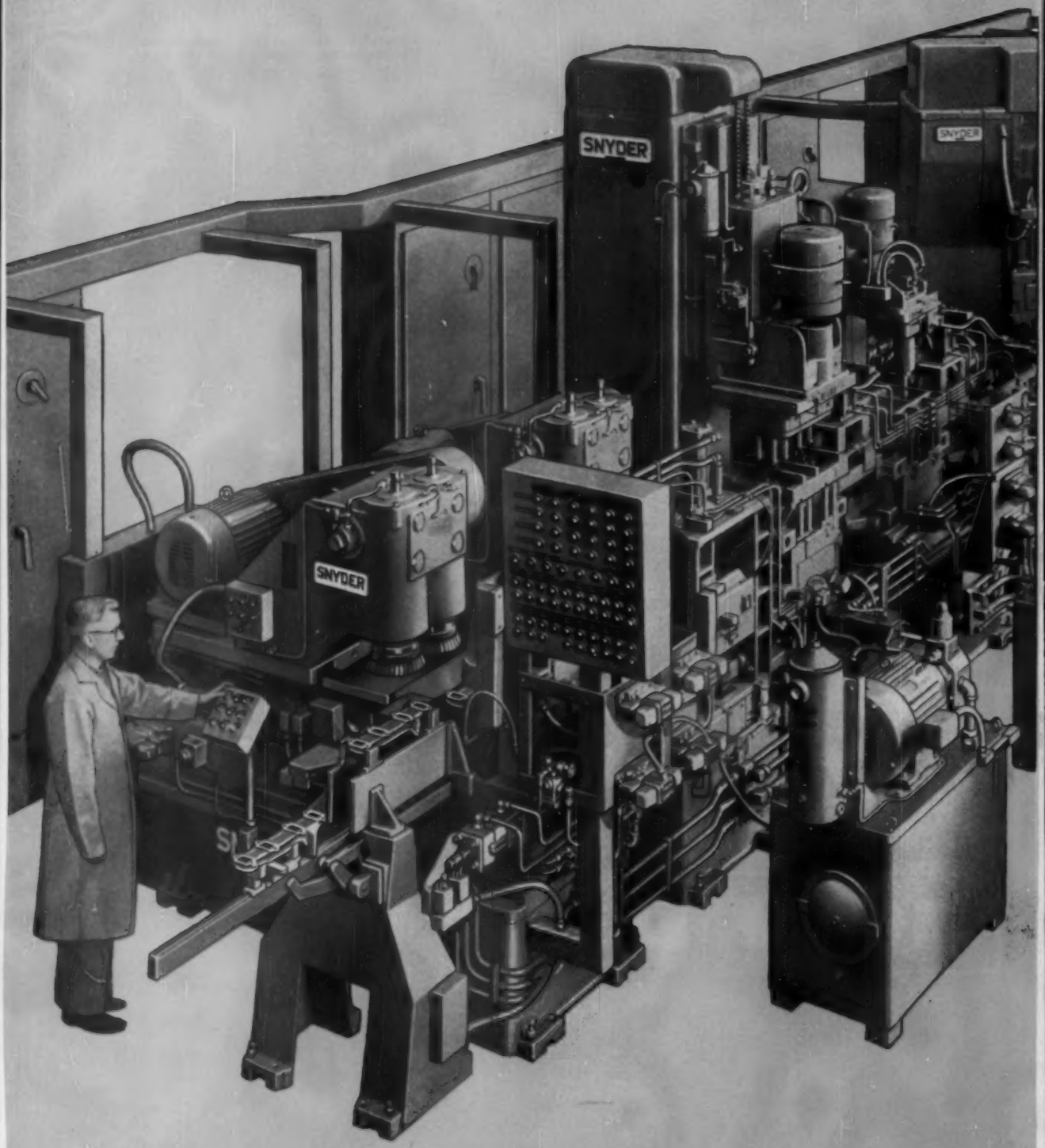
The G. A. GRAY Co.,
Cincinnati, Ohio

the only

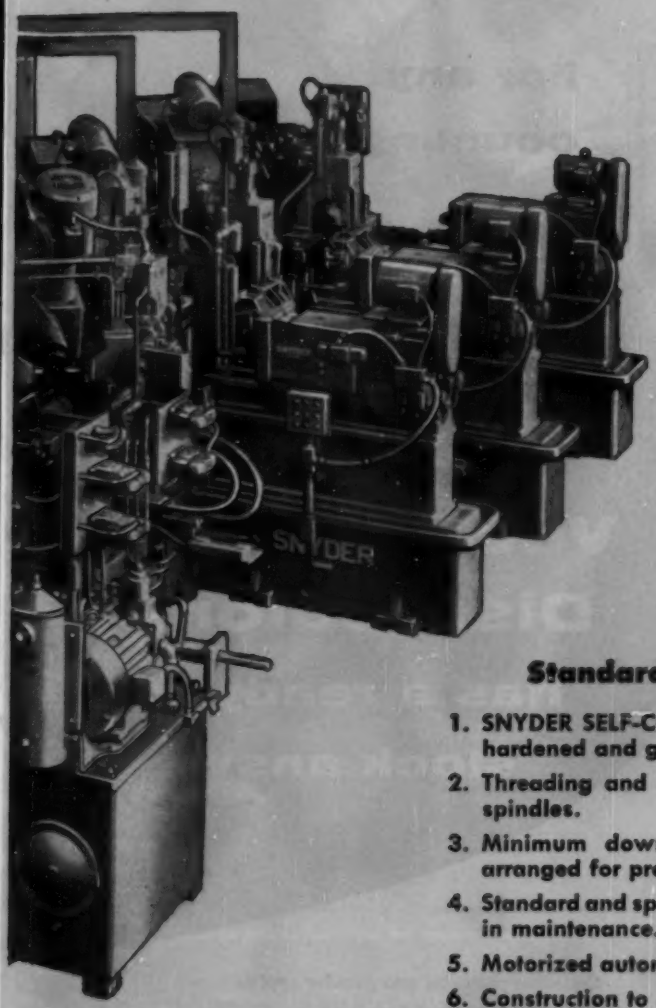
GRAY Universal Planer shown in operation at the Baltimore plant of Koppers Company, Inc., Metal Products Division.

new planer

Two Different Exhaust Manifolds Processed by Snyder Special



Simultaneously in Random Sequence In-Line Transfer Machine



SPECIAL FEATURES

1. Production: 136 manifolds per hour.
2. 28 Stations: Operations include milling, drilling, chamfering, probing and tapping.
3. Manifolds "A" and "B", loaded at random, are identified by built-in sensing devices which activate or idle machining units at appropriate stations as required by the different parts. Parts "A" and "B" are identically processed at Stations 1, 4, 6, 7, 8, 9. At Stations 6, 7 and 9, sensing devices detect Part "B" and bring in automatic clamp support. Both parts are turned over at Station 12. Part "A" is processed at Stations 14, 16, 17, 18, 19. Part "B" is processed at Stations 22, 24, 25, 26, 27 and both parts are unloaded at Station 28 by automation equipment.
4. Individual base segments provide maximum flexibility for future part design changes.
5. Floor space: 63′ x 20′.

Standard Features of Snyder Machines

1. SNYDER SELF-CONTAINED UNITS and other units equipped with hardened and ground ways.
2. Threading and tap heads equipped with individual lead-screw spindles.
3. Minimum downtime for tool changes because spindles are arranged for pre-set cutting tools.
4. Standard and special parts interchangeable for speed and economy in maintenance.
5. Motorized automatic lubrication system for all moving parts.
6. Construction to J. I. C. Standards throughout.
7. Master Push Button Panel and Light Console at Station 1.
8. Each unit equipped with its own push button control station for ease of tool setup and manual operation of unit.
9. Electrical interlocks and full depth circuit throughout.
10. Panels equipped with SNYDER CIRCUIT SLEUTH.

SNYDER

TOOL & ENGINEERING COMPANY

3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

32 Years of Special Machine Tools with Automation

For any counting problem...

your Veeder-Root Distributor has a ready "stock answer"

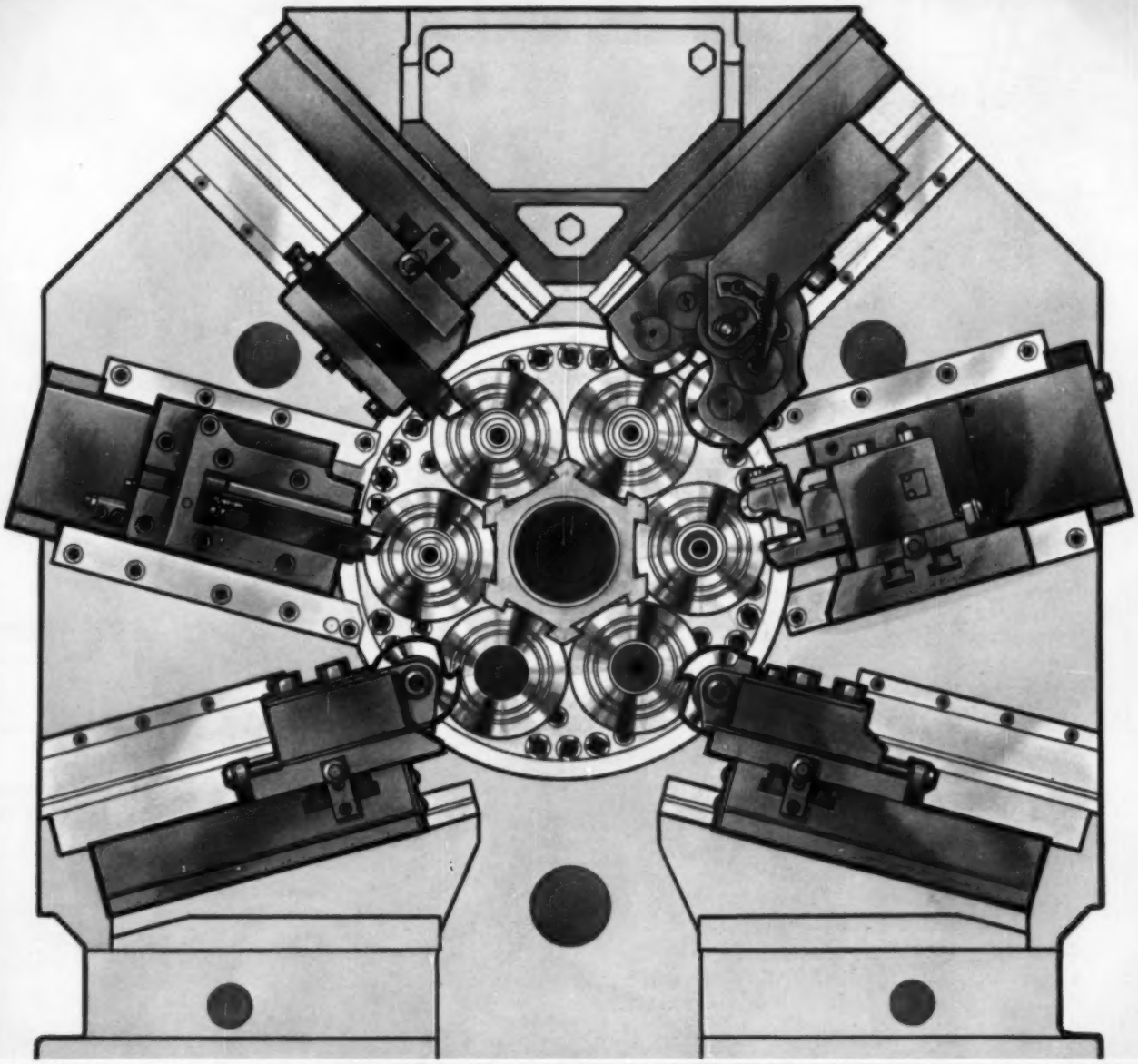
Counting problems and counter applications vary as widely as words in the dictionary. But there's one place where *all* these problems can be met and solved, quickly and at low cost.

That place is the stockroom of your Veeder-Root Distributor. There on his shelves, in the bright red, white and blue packages, are the basic Veeder-Root electrical and mechanical counters that can be adapted to machines and processes in every industry from automotive to zinc die-casting.

Sounds like a "big order." Just try him with an order and see for yourself!
For your nearest distributor, write D. G. Dresser, Veeder-Root Inc., Hartford 2, Connecticut.

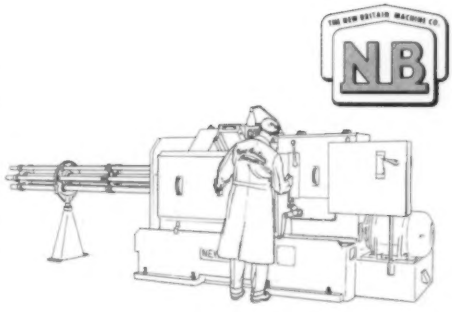
Count on VEEDER-ROOT
to help you build business with Mechanical, Electrical & Hand Counters for every industrial application

Everyone can count on
VEEDER-ROOT
"The Name that Counts"
Hartford 2, Connecticut

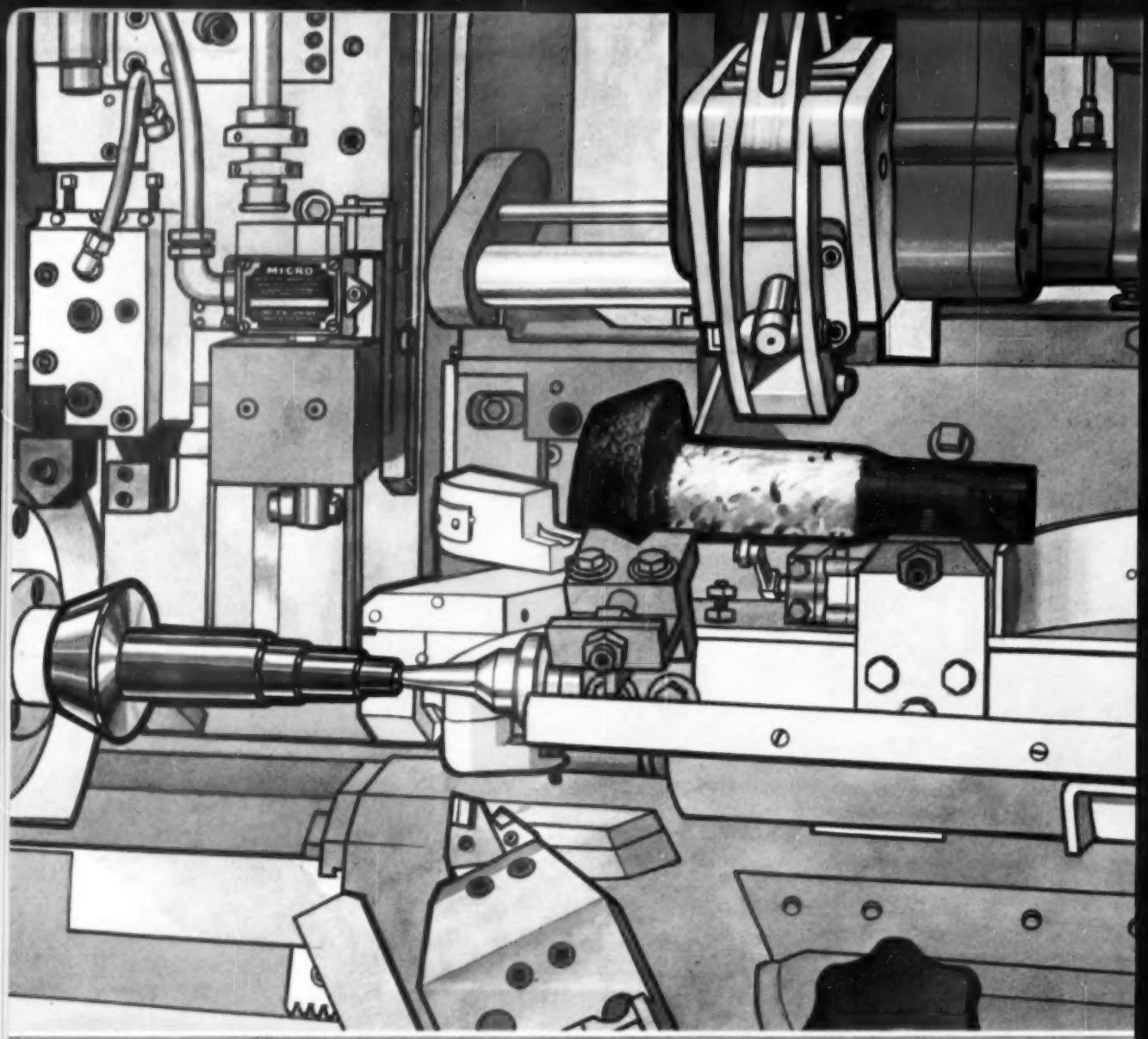


six spindles — six cross slides

Here you see the possibilities for new flexibility of bar machine set-ups with *a cross slide in every position.* Six independent cross slides. More operations on one bar machine. Six independent radial cross slides for forming, roll threading, shaving, skiving, angular facing, knurling, hobbing and undercutting with simpler tools and attachments, through the use of cross slides. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



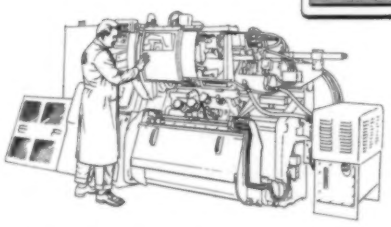
Automatic Bar Machine



no hands — no headaches

Automatic loading of forgings, bar slugs and bar stock is a basic optional design feature of New Britain +GF+ Copying Lathes. It saves labor and makes a substantial reduction in production time per piece.

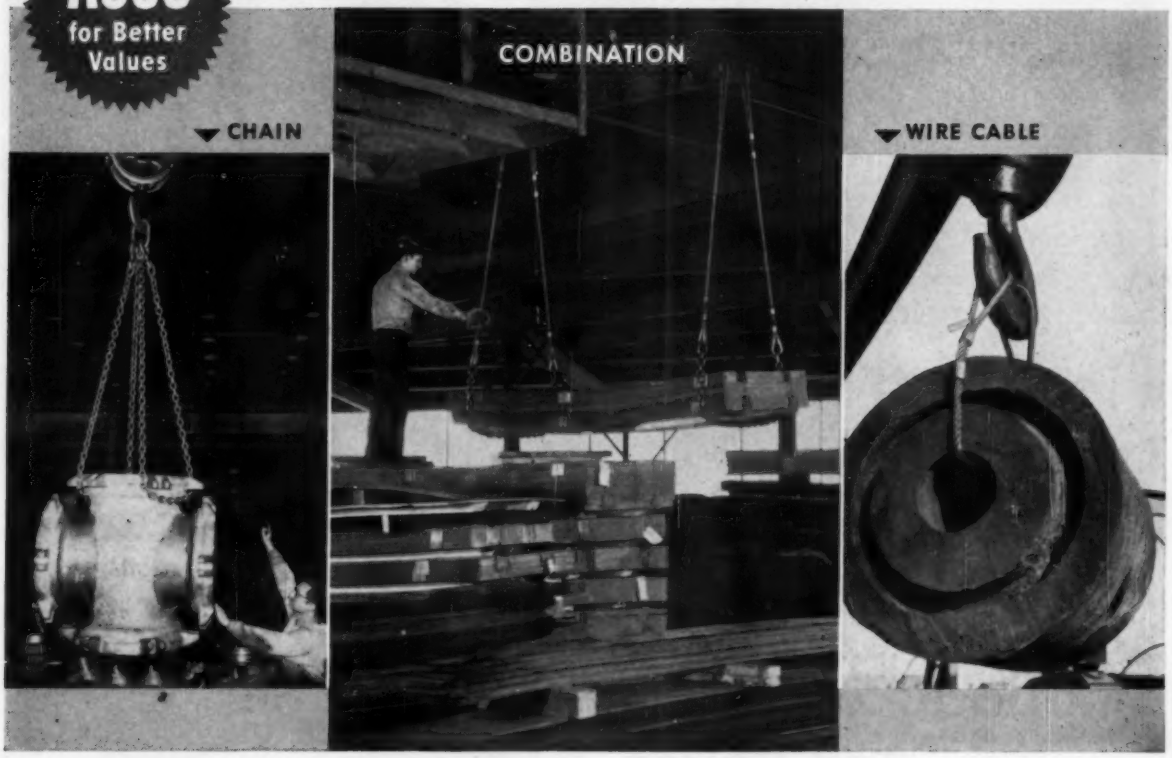
Positive, accurate loading, single point tooling and template control mean fewer headaches and larger profits on your lathe work. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



New Britain +GF+ Copying Lathe

ACCO for Better Values

Acco Registered® Slings—Chain and Cable



ACCO—your first source for any sling for any job

Whatever your sling requirements, there's an ACCO *Registered* Sling to do your particular lifting job in the safest, most economical way possible. Your rigger knows why certain slings should be used to lift certain types of loads, depending on varying factors of shape, weight, material and finish. Sometimes chain slings are necessary; other times cable; and on certain lifts a combination of chain and cable slings are best.

Because sling work requirements do vary from job to job, make certain that all your slings are precision-made under uniform conditions of quality control and pre-tested before they leave the factory. Only ACCO *Registered* Slings can give you this assurance...in the widest range of sizes and styles from any single source.

In addition, you get the latest technical improvements in ACCO *Registered* Slings. For example, there's the new shaped Master Link now available without extra charge on all ACCO *Registered* Slings. This new link, an exclusive development of ACCO engineers, gives 18% greater resistance to distortion with no increase in weight. Just one more quality bonus you get from ACCO *Registered* Slings.

Each of these slings is factory proof-tested at a load of no less than twice its rated capacity. Only after a sling has passed this rigorous test is it given the ACCO tag and certificate of registration.

Tell your distributor you prefer ACCO *Registered* Slings.

WHAT "ACCO REGISTERED" MEANS

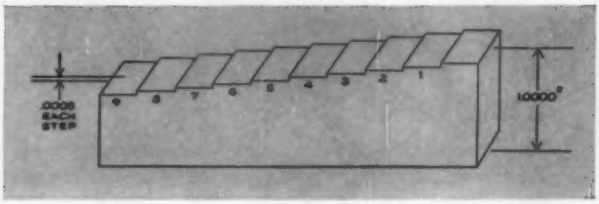
1. The best material
2. Unit safety factor (on bodies, rings, links, hooks)
3. Proof test of complete sling to twice the working load limit
4. Actual field service test of each design
5. Metal identification ring or tag on each sling
6. Signed Registry Certificate with each sling

AMERICAN CHAIN & CABLE
BRIDGEPORT, CONN.

ACCO

Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Wilkes-Barre, Pa., York, Pa.
In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

New Step-Block Test Shows .000012″ Downfeed Accuracy on Taft-Peirce No. 1 Grinder



This is the Taft-Peirce No. 1 Precision Surface Grinder. It offers the exclusive tilting wheelhead plus a selection of seventeen different attachments for all-purpose application. Operators easily grind to .0001″, and to .00005″ with experience. Surfaces are so smooth they seal without lapping.

Gagemaker tolerances easily produced with exclusive T-P Vernier Fine-Feed — for tool room or small parts production.

Tests of grinding accuracy on a Taft-Peirce No. 1 Grinder constantly prove the remarkable accuracy of this machine. The latest — a step-block demonstration — shows just what tolerances you can expect.

A four inch long block was ground to a height of 1.0000″, then nine consecutive steps in depth increments of .0005″ were ground, using the Vernier Fine-Feed. Result: Inspection of height at each step revealed an average error of only .000012″! A T-P Versachek Electronic Gage with 4000:1 magnification was used for inspection.

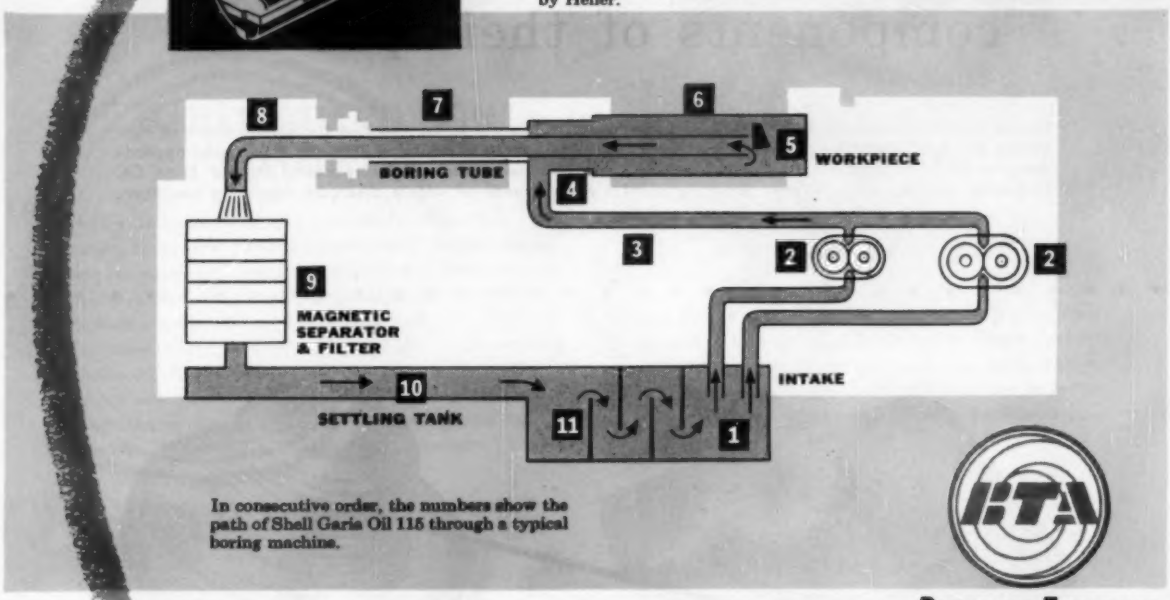
This remarkable downfeed accuracy offers superlative results for tool, die, and gage work; as well as for small parts production. Plan now to add this all-purpose precision grinder to your facilities — send for Data Sheet MT-001 and Catalog.

TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

T-P Means TOP Precision

Tools for drilling, trepanning and boring developed and patented by Heller.



In consecutive order, the numbers show the path of Shell Garia Oil 115 through a typical boring machine.

BORING AND TREPANNING ASSOCIATION

Revolutionary new rapid boring tools last 50% longer with Shell Garia Oil 115

American Heller Corporation is introducing to the U.S.A. new tools for extremely high-speed boring, trepanning and drilling of deep holes. These precision tools offer the double advantage of high-speed accuracy and excellent finish.

Used in conjunction with suitable boring machines, the tools make use of this new technique:

Cutting oil is forced between the boring bar and wall of stock, forming a continuous bearing. The oil is forced back through the hollow boring bar, carrying away the chips as it goes. Tool faces are kept clean and chip passage clear. Chips do not come in contact with finished bore. This insures greater accuracy at higher speeds and feeds than ever before possible.

This operation required a cutting oil with extreme pressure and excellent cooling characteristics. Working with Heller, Shell engineers developed Garia® Oil 115. Experience with the new cutting oil has proved that tool life is increased 50% over conventional drilling or cutting oils. Garia Oil 115 is approved and recommended by the Boring and Trepanning Association.

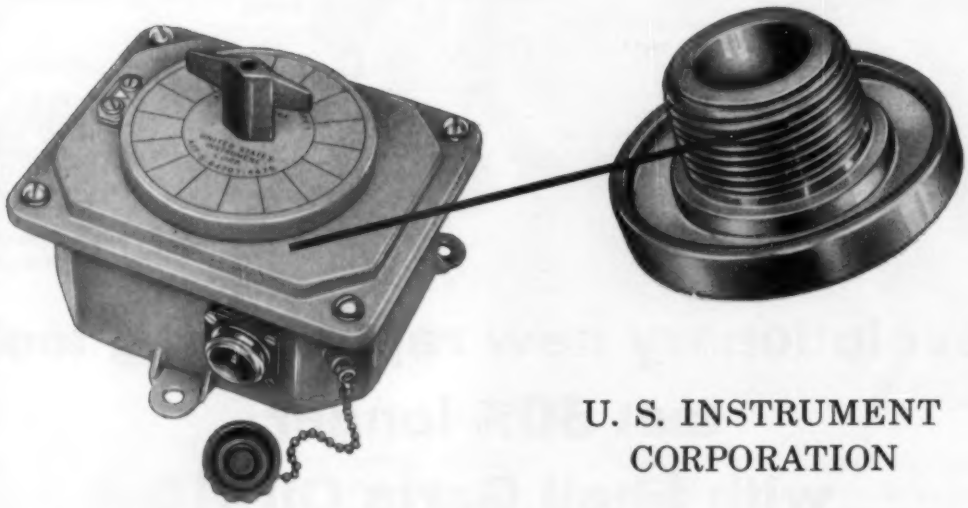
For more information on Shell Garia Oil 115, write to Shell Oil Company, 50 West 50th Street, New York 20, N. Y., or 100 Bush Street, San Francisco 6, California.

SHELL GARIA OIL 115

SHELL

Three more nationally known manufacturers select Mueller Brass Co. Forgeable Bearing Alloys for vital components of their products

In ever-increasing numbers, Mueller Brass Co. specialized alloys are being specified by manufacturers of top-quality products. In a series of continuing advertisements, we have presented case histories of successful applications, to which we now add three more distinguished companies who are incorporating Mueller Brass Co. forgeable bearing alloys in their products to meet the demands of widely divergent operating conditions.



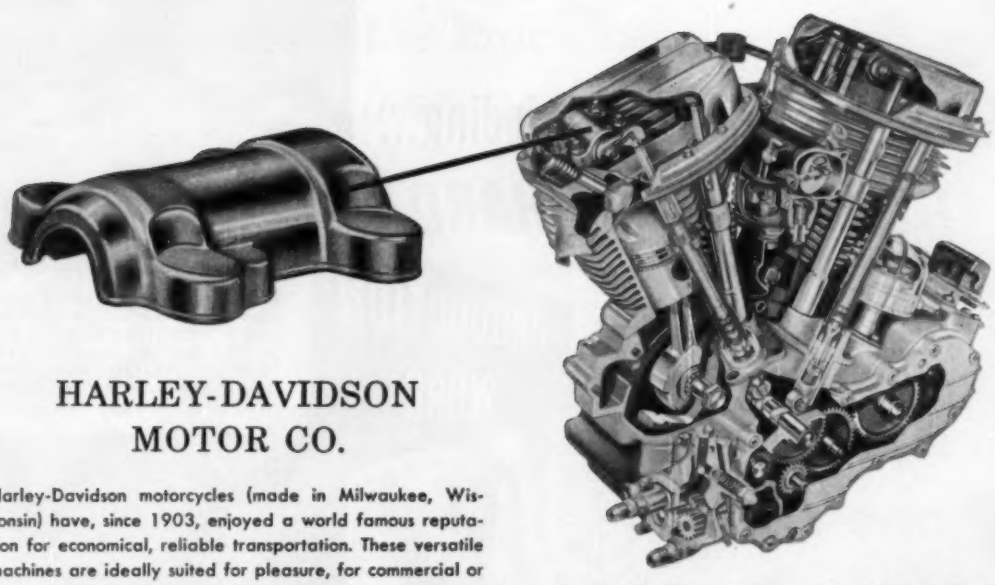
U. S. INSTRUMENT CORPORATION

U. S. Instrument Corporation, Charlottesville, Va., selected abrasive-resistant Mueller bronze alloy bushings for their remarkable telephone selector switches after exhaustive tests of many materials. A vital communications link on today's U. S. Naval vessels, these sound-powered telephone circuits must meet rigid Navy performance-standards. Such phones, for example, must have selector switches which are capable of rotating for a minimum of 50,000 torturous cycles . . . 360° clockwise, followed by 360° counter-clockwise. In addition, the "O" ring must still form a water-tight seal AT THE END OF THE TEST! Of the many tested, a Mueller Brass Co. special manganese bronze alloy was the best one meeting these rigid specifications.

There were other important reasons why these bushings were chosen by U. S. Instrument Corporation for this application. Resistance to abrasive action against the rubber "O" ring was a prime one . . . then, too, the stem assembly suffered severe pounding through the action of the indexing mechanism which, prior to the use of the Mueller Brass Co. alloy, caused repeated seizure of the component parts. In this particular application, the part was fabricated on an automatic screw machine rather than produced as a forging. The versatility of Mueller Brass Co. alloys makes them readily adaptable to the most economical method of fabrication dependent upon the size, shape, and end-use requirements of the part.

In commenting on the success of this part, U. S. Instrument Corporation praised the alloy for its tensile strength (ordinary brasses could not withstand the 2000 ft. lb. impacts without deformation), for its machinability and corrosion-resistance.

MUELLER BRASS CO.



HARLEY-DAVIDSON MOTOR CO.

Harley-Davidson motorcycles (made in Milwaukee, Wisconsin) have, since 1903, enjoyed a world famous reputation for economical, reliable transportation. These versatile machines are ideally suited for pleasure, for commercial or business use, as well as the grueling demands of law enforcement work. Harley-Davidsons boast a dependable engine . . . one which can roll up an astounding mileage record with little or no care. The painstaking selection of every engine component is one important reason for this reliability. The new twin-cylinder Harley-Davidson 74 OHV employs Mueller Brass Co. bronze alloy forgings in the form of rocker-arm bearing caps. Subjected to violent temperature changes, fast starts and stops and road shock, Mueller forgings are proving again and again that they have the ability necessary to withstand almost any punishment . . . and still provide unfailing service.

JACOBSEN MFG. CO.

Jacobsen Mfg. Co., Racine, Wisconsin, was among the first to produce a practical power mower for home use. That was more than 35 years ago! Today, Jacobsen power-mower dependability is evident itself in more than a dozen gleaming new models such as the popular Pacer, Lawn Queen, Manor and others. One of the most reliable components in the always dependable Jacobsen hi-torque engine is a Mueller Brass Co. connecting rod forged from special bronze alloy. Jacobsen mowers with Mueller-forged connecting rods are called upon by some commercial users to operate as much as 8 hours daily, 6 days a week . . . perhaps as much as 2000 hours a year. In searing summer temperatures, thru hours of constant operation, the high uniform strength of Mueller bronze forgings constantly withstands pounding and vibration with the same conspicuous success as in its many other applications.

Why not investigate these specialized alloys for your own products. We welcome your inquiries. Our engineering staff will be happy to make specific recommendations. Both on the proper alloy and the best method of fabrication to meet your needs . . . exactly. Our engineering manuals show many, many examples of how American manufacturers have used these alloys to great advantage.

• WRITE TODAY FOR THE ENGINEERING MANUAL YOU NEED

- **Mueller Brass Co. Forgings** Engineering Manual H-58565 ☐
- **Tuf Stuf Aluminum Bronze Alloys** Engineering Manual H-58563 ☐
- **"600" Series Bearing Alloys** Engineering Manual FM-3000 ☐
- **Copper Base Alloys in Rod Form** Engineering Manual FM-3010 ☐

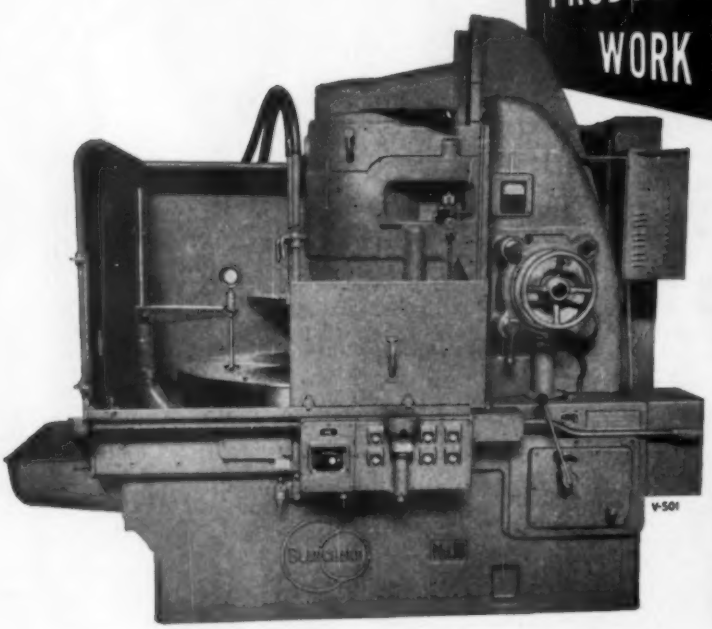
227

PORT HURON 24, MICHIGAN

for BEST results in surface grinding...

PUT IT ON THE BLANCHARD

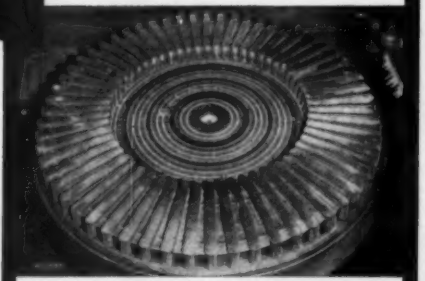
PRODUCTION WORK



Blanchard Grinders are used throughout industry on surface grinding jobs that demand the utmost in production, finish and accuracy.

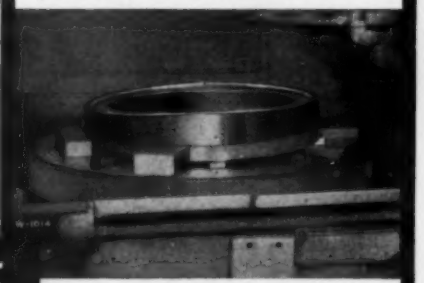
Whatever *you're* surface grinding, there's a Blanchard designed to do the job speedily and accurately.

SIDE PLATES. 9" x 18" plates ground from rough on No. 18 Blanchard with 36" chuck. Stock removal 1/16" to 1/8" per side. Held flat within .003", parallel to .001", and to dimension tolerance of ±.001". Production: 30 surfaces per hour.



CONNECTING LEVERS. Cast iron levers ground in special magnetic fixture with pins located in "vee's". Stock removal per side is 1/32" to 1/16"; must be flat and at right angles to pins. No. 18 production: 180 pieces per hour, compared to 20 pieces per hour by former method used.

MAINTENANCE AND ODD LOT WORK



HARDENED STEEL PUNCHES. This 24-13/16" dia. punch, reground on a No. 18, is centered radially on 36" magnetic chuck. Duplicate circumferential and radial shear reliefs are generated with two setups.

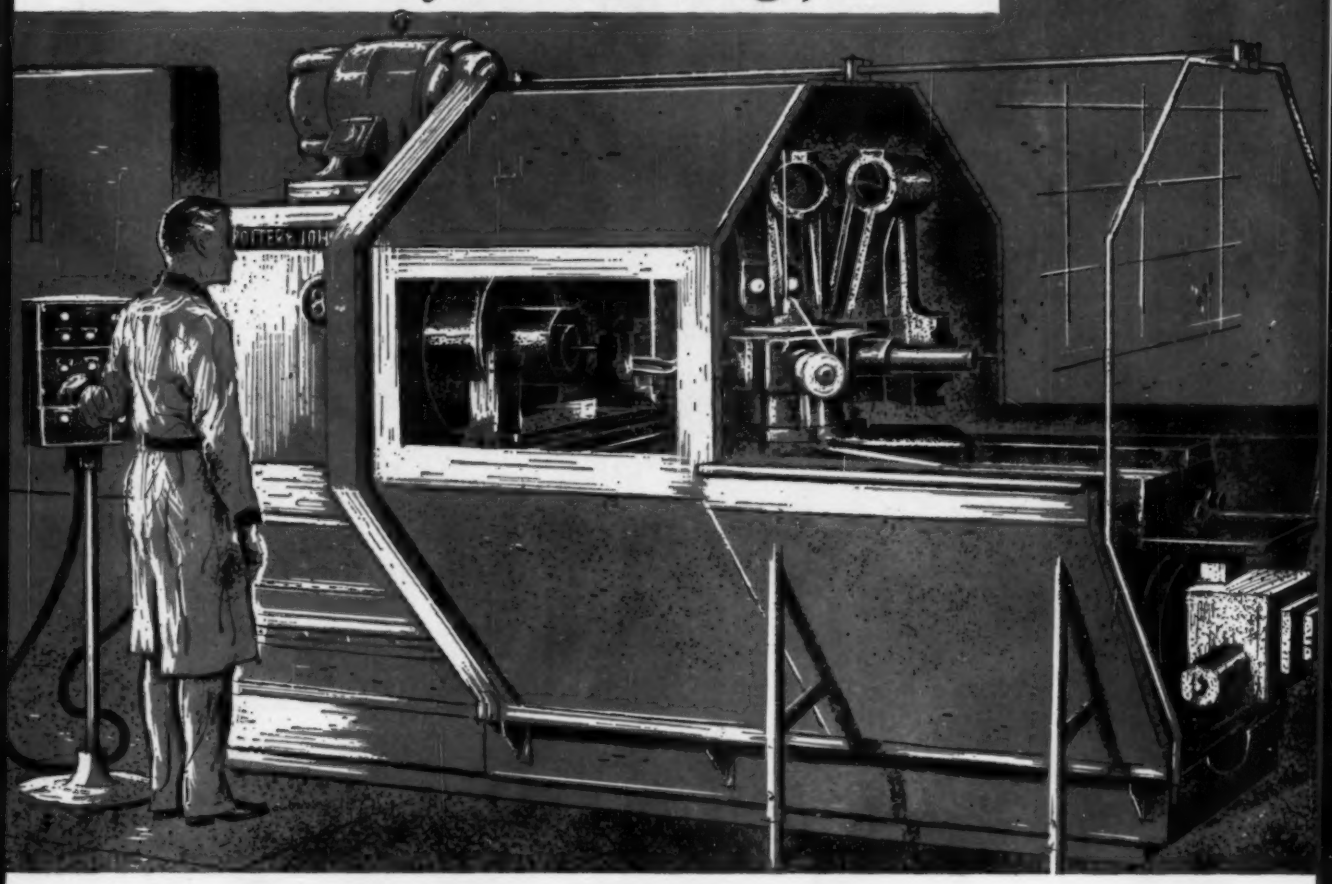
GRANITE SURFACE PLATES. A No. 18 Blanchard reconditions this 18' x 34" granite surface plate by grinding it flat within .0002". 3/16" of stock is removed in 5 hours.

PUT IT ON THE **BLANCHARD**

Send for free copies of "Work done on the Blanchard", fifth edition, and "The Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

*Here it is . . . . the machine industry's been asking for !**

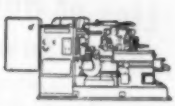


THE NEW P&J 8-U

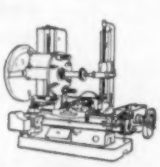
AUTOMATIC Turret Lathe

***A MACHINE TO FILL THE GAP BETWEEN OUR 6 DREL-40 AND 10-U**

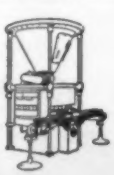
Here is a new automatic with the extra power, rigidity and capacity you may be looking for. It's designed and engineered to handle your really big, hard-to-machine jobs faster, better and more economically than ever before. It will hog out tough alloys in a hurry, hold close tolerances and produce fine finishes with speed and efficiency. The 8-U with 50 hp, 30″ chuck and 40″ swing is intermediate in size between our 6 DREL-40 and 10-U. Take a minute now to write for specification circular and see how the new P&J 8-U fits into your production schedules.
Potter & Johnston Company, Pawtucket, Rhode Island.



AUTOMATIC TURRET LATHES



GEAR CUTTERS



GILDA PACKAGING MACHINES

POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898

the NEW MARVEL SAWING DEMONSTRATION ROOM!

The Complete Marvel Line of Hack Saws and Band Saws Operating!

...available for demonstration or testing on your own material!

How would you like to run sawing tests on your own material... watch demonstrations under actual working conditions, of the world's most modern hack saws and band saws—and compare, if you wish, band sawing and hack sawing to see which type of saw is best for you?

You are cordially invited to come in to see and make use of the Sawing Demonstration Room—the most complete and up-to-date facility of its type in the country. Staffed by experienced metal sawing engineers and technicians, the Sawing Demonstration Room has been set up for your convenience. We sincerely believe you will find it interesting and helpful in your selection of metal sawing equipment.

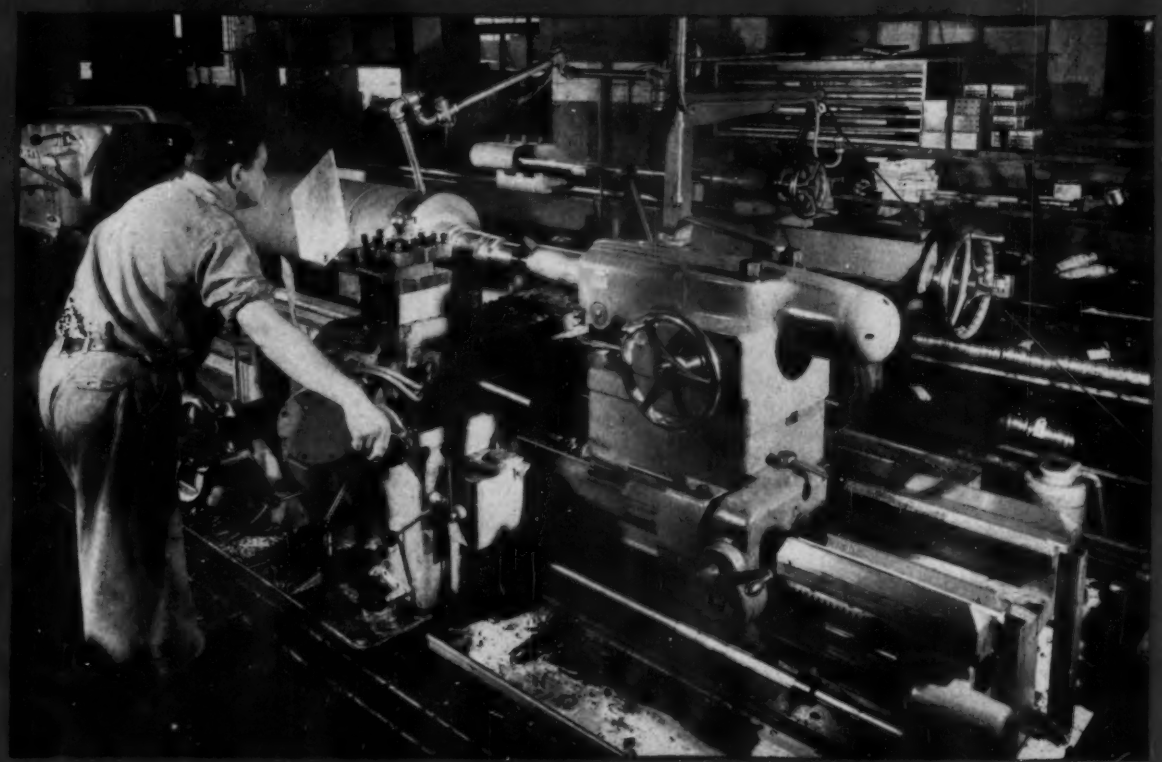
Here, you will see the most modern single cut and automatic bar feed hack saws and band saws (including the *all new* MARVEL No. 81 and 81A Universal Hydraulic Band Saws equipped with the amazing "TRUE-LINE" Automatic Blade Control (Basic Patent Applied For) and using High Speed Steel Band Saw Blades.)

If you have any type of sawing problem, or if you would just like to come in and see a demonstration of the fine cutting MARVEL Saws can do, the Demonstration Room is always open to you.

MARVEL *Metal Cutting* SAWS
Better Machines–Better Blades

ARMSTRONG-BLUM MFG. CO.
5700 W. BLOOMINGDALE AVE., CHICAGO, ILL.

FROM 12½ HOURS... TO 4½ HOURS... plus BETTER FINISH



Bulletin No. 135 gives a complete description and shows many examples. It's yours for the asking.

R. Hoe & Co. Inc., New York world renowned manufacturers of printing presses, has actually accomplished this in the machining of their impression cylinders.

Using a 32" "AMERICAN" Hydraulic Tracing Lathe, the cylinder journal shapes are generated from a template and the 15" diameter cylinder body is turned straight without the template control.

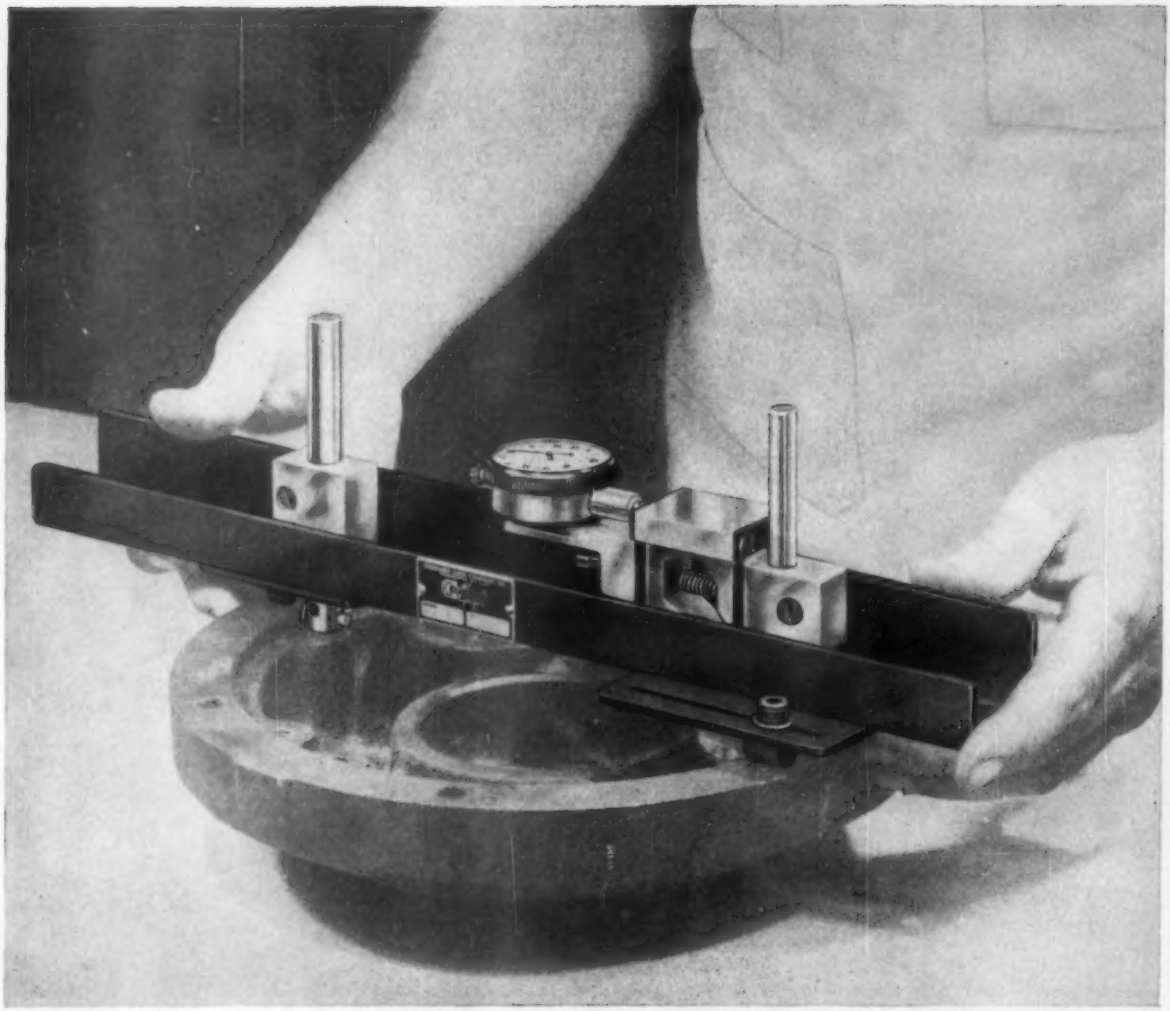
The all-hydraulic tracing unit in combination with the accuracy and rigidity inherent in "AMERICAN" lathes insures the highest quality of work both from the standpoint of accuracy and fine finish.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

More production per man hour is the answer and the only answer to spiraling costs—modern, high production machinery is the answer to greater production per man hour.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



NOW! *Adjustable* Shallow Diameter Gages LOWEST PRICE . . . *"Tenth"* Accuracy

This new, multi-purpose, multi-range series *by STANDARD* obsoletes the need for expensive, specially designed shallow diameter gages. *New type* reed-linkage insures positive, accurate transfer of movement from contact point to indicator.

Gages are easily set to regular adjustable masters or with gage blocks and parallels. Tail and head assemblies are interchangeable between frames of different lengths. Smallest size permits checking I.D's or O.D's down to 4" and depth adjustment permits easy measurement from 0" to 2" below supporting plane. Greater depth ranges if needed.

All this at *lowest price*. So, if your production includes any problems of shallow diameter gaging be sure to ask the *Man from Standard*. Or, write us right here at the plant.

STANDARD® GAGE COMPANY, INC.
SINCE 1925
POUGHKEEPSIE, N.Y.

A COMPLETE LINE OF GAGES . . . INDICATING, FIXED AND ADJUSTABLE TYPES

Why the Die Maker Prefers PRODUCTO Die Sets

Volkert Stampings, Inc.

The die maker likes to work with Producto Die Sets

He knows Producto die sets are easy to assemble —especially those equipped with the unique new Qwik-Fit Guide Pins*.

He has confidence in the consistent accuracy of Producto sets. He has found that they always align his dies correctly.

He knows he can choose from a variety of thicknesses the Producto die set that meets the strength requirements of his die.

He favors Producto die sets because they are dependable. They will perform on the press as well as they did in tryout.

He likes the attractive, streamlined appearance of Producto sets. They make his dies look better and increase his pride in these products of his craftsmanship.

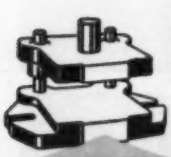
*Patent Pending

He knows that a nearby Producto warehouse can supply any catalog die set he needs...and that orders for specials are promptly processed. He can count on having the die set by the time he needs it.

The die maker has found that all of his requirements are met by Producto die sets. You will, too, when you place your order with Producto.

DIE SET DIGEST, our eight-page quarterly, contains valuable data for designers, makers and users of dies. Write to have your name added to mailing list.

THE PRODUCTO MACHINE COMPANY
975 Housatonic Ave., Bridgeport 1, Connecticut



Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

Up to 40% higher tightening torques keep a

—and only the combination of an UNBRAKO screw

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES (Inch-Pounds)

SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

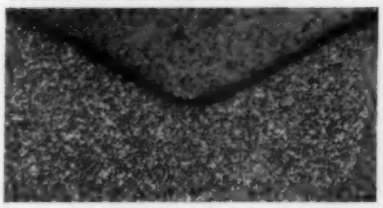
The High-Torque UNBRAKO socket set screw is made to withstand the highest tightening torques ever used to seat a set screw—up to 40% higher than an ordinary set screw. But to take full advantage of this UNBRAKO feature you must have a key that can apply the force required to seat it without damaging the screw or snapping the key. The High-Titan UNBRAKO hex key is designed specifically to set a High-Torque UNBRAKO so that you can be assured of full *high-torque* performance every time.

Here's why a High-Torque UNBRAKO can be seated tighter—and stay put

UNBRAKO SET SCREW

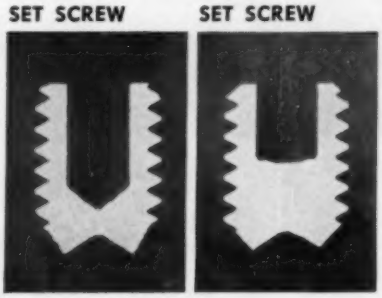
It has fully formed threads that make the whole screw stronger. The metal is compressed into the closely knit grain structure that you see in this illustration. The grain flow follows the contour of the threads. There are no straight lines along which shear can occur. The UNBRAKO retains its flow lines even when ground down to .010 in. below root diameter. Screws with cut or ground threads lose thread form at root diameter.

UNBRAKO SET SCREW



The High-Torque UNBRAKO has a radius in the socket corners. This eliminates the sharp corners where cracks start. It also distributes the stresses developed when tightening torques are applied. Ordinary socket screws have sharp corners which often crack when tightened even at lower torques than those recommended for UNBRAKO.

UNBRAKO SET SCREW **ORDINARY SET SCREW**



The High-Torque UNBRAKO has a deeper socket, which gives you more purchase with the wrench. Since more wrench can be put into the UNBRAKO socket, you can set the screw much tighter. And you won't ream the socket or round the corners of the wrench.

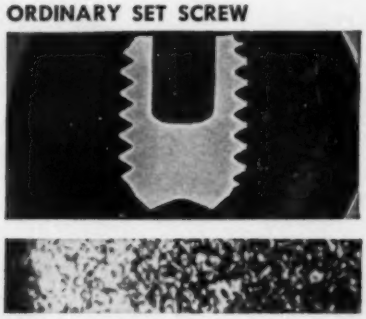
UNBRAKO SET SCREW

The High-Torque UNBRAKO is properly heat treated, kept clean. Its grain structure is uniform. It is free of decarburization. There's no danger of stripping the threads or shearing the point when tightening

High-Torque UNBRAKO socket set screw tight

and key assures full *high-torque* performance

ORDINARY SET SCREW



torques are applied. The ordinary screw is suffering from an overdose of decarburization; socket walls, threads and point are full of the telltale white spots that identify it.

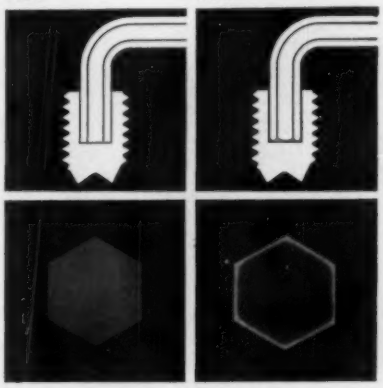
And here's why an UNBRAKO High-Titan hex key can be used to apply far more tightening torque to a High-Torque UNBRAKO socket set screw than is needed without damaging either the screw or the key.

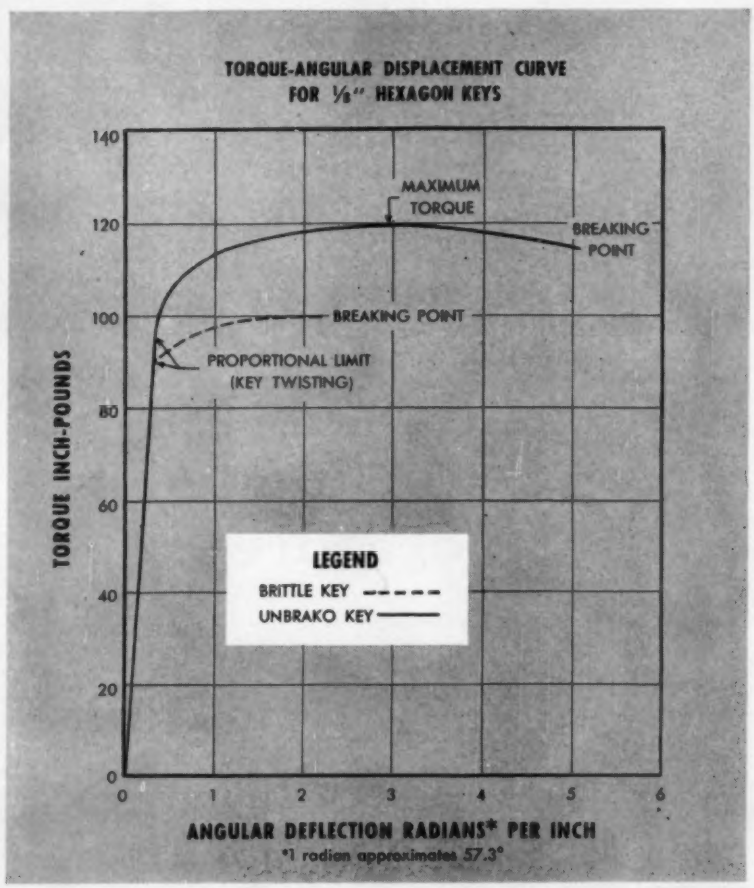
The High-Titan UNBRAKO is not an ordinary hex key. It is a precision internal wrenching tool with high ductility, specially designed to assure full high-torque performance. It is made of special alloy steel bar stock, inspected magnetically and chemically to make sure that the material is flawless and of the specified properties.

Its sides are flat and parallel. The corners, which exert torque on the inner walls of the socket, are sharp and tough. The bend is strong.

The High-Titan UNBRAKO is accurately sized across the flats and across the corners to insure snug fit and full wall contact. It won't ream or wear an UNBRAKO socket. The square cut end engages the full depth of the socket for greater tightening power. It gives you up to 25% more wrench engagement than a key with a chamfered end.

UNBRAKO KEY **CHAMFERED END KEY**





The High-Titan UNBRAKO hex key is heat treated in modern atmosphere-controlled furnaces. The surface is casehardened without decarburization. The extra hard surface gives the key longer life. And it retains its dimensional accuracy, is tougher and more ductile than ordinary keys. This torque-angular displacement curve for ⅛ in. hexagon keys distinguishes a High-Titan UNBRAKO from an ordinary key. The High-Titan UNBRAKO has a higher yield point and a higher breaking point—you can exert a much higher torque with it without snapping the key.

Be sure you get the full high-torque performance offered only by the combination of a High-Torque UNBRAKO socket set screw and a High-Titan UNBRAKO hex key. Both products are stocked by authorized industrial distributors. Ask the one nearest you for complete information. Or write STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

We also manufacture precision titanium fasteners. Write for free booklet.

Unbrako Socket Screw Division **sps** **Jenkintown 1, Pennsylvania**

Standard Pressed Steel Co. • The Cleveland Cap Screw Co. • Cooper Precision Products • Standco Canada, Ltd. • Unbrako Socket Screw Co., Ltd.

Tough 2½" diameter mandrel at Rc 44 on 1150 ton brass extrusion press. Scovill Manufacturing Co.

Mandrel of HALCOMB 218 retains toughness and hardness at hot work temperatures...

This mandrel is made of Halcomb 218—a tough, air-hardening hot work steel. Halcomb 218 is suitable for tools like this which require a higher degree of toughness at moderately elevated temperatures than is obtainable with the tungsten types of hot work steels. And Halcomb 218 *retains both* its hardness and strength at these temperatures.

For example, at a hardness of Rc 44, Halcomb 218's Charpy Impact Strength is 33 ft-lbs at 500F. And it will retain this hardness after 1 hour, after 10 hours and even after 100 hours at temperatures up to 900F.

Properties like these cut tooling costs. The mandrel shown above is good for 1200 pushes, for example, and even then all it needs, usually, is repolishing before being used again.

Halcomb 218 is particularly useful for all hot work operations on which drastic coolants are used. It even resists breaking very successfully when water cooled in operation. If these sound like advantages you can use, call your local Crucible representative for more complete data. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

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Quick as a...

on a lathe
specifically designed
for production
with accuracy and economy

High speed turning, boring and facing are child's play . . . with the Lodge & Shipley HI-TURN Lathe. Whether on single or multiple-piece work, this 10" Production Lathe provides productive capacity at a price substantially below conventional lathes.

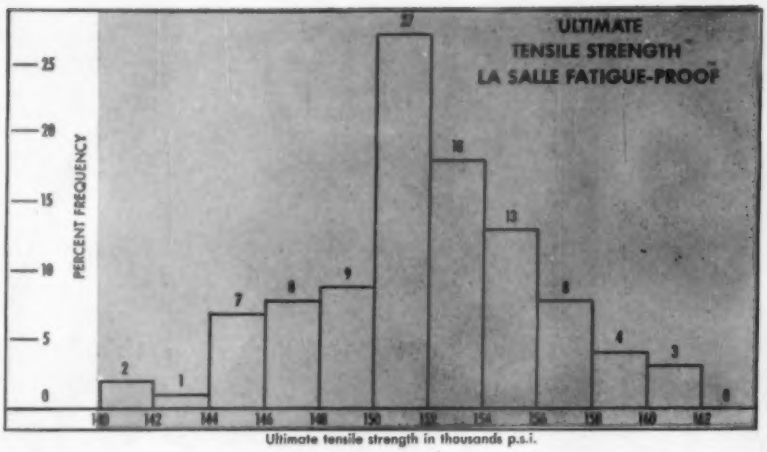
Designed for fast, convenient operation, it eliminates rarely used features, incorporates many standard features never before found at any cost in a lathe of this size.

The 10" HI-TURN gives you horsepower, rigidity and production you would normally expect to find in lathes costing twice as much. We can prove more production per lathe dollar . . . more production per operator hour!

Find out how the HI-TURN Lathe fits your turning requirements.

WRITE: LODGE & SHIPLEY, 3056 COLERAIN AVE., CINCINNATI 25, OHIO

your LODGE-*ical choice!* **Lodge & Shipley**



The above chart shows the range of ultimate tensile strength over a period of one year's production. Average value obtained is approximately 150,000 p.s.i.

"e.t.d."™ Process Applied to FATIGUE-PROOF™ Steel Bars Gives Added Strength, Greater Uniformity, Better Machinability

Guaranteed 140,000 p.s.i. minimum tensile... no heat treating necessary

Six important physical and mechanical properties, (1) a high strength level, (2) exceptional uniformity, (3) improved machinability, (4) wear resistance, (5) resistance to fatigue, and (6) dimensional stability, are desirable features of La Salle "FATIGUE-PROOF" steel bars, produced by the new "e.t.d." (Elevated Temperature Drawing) process.

Strength . . . "FATIGUE-PROOF" is a carbon steel bar which replaces both hot-rolled or cold-finished carbon and alloy heat-treatable steel bars. Production figures show hardnesses between Rc 30 and Rc 36 (with a minimum hardness guarantee of Rc 30). The guaranteed minimum tensile strength is 140,000 p.s.i. with a 150,000 p.s.i. average.

"FATIGUE-PROOF" is better than a heat treated bar because it is not quenched and tempered and so the problems frequently associated with quenching and tempering such as (1) quench cracks, (2) non-uniformity of section, (3) soft centers, and (4) heat treat distortion are eliminated. Costly secondary operations such as grinding, cleaning, and straightening are not necessary. Rejects are minimized.

Exceptional uniformity... "FATIGUE-PROOF" is remarkably uniform from bar to bar, end to end, size to size, and lot to lot. Design and production engineers can depend upon it being the same from day to day and job to job.

Individual processing of each bar plus the inherent good qualities and characteristics of the "e.t.d." process account for the excellent uniformity. Microstructures are uniformly pearlitic.

Improved machinability... "FATIGUE-PROOF", made by "e.t.d.", machines 50% to 100% faster than heat treated alloys, and 25% faster than annealed alloy steels. It machines with a very fine finish, and gives excellent tool life. These characteristics make it an ideal steel for production parts.

Wearability . . . Field applications such as gears, pinions, pins, and screws prove that "FATIGUE-PROOF" has good wear resistance. It resists galling and seizure, partly due to its hardness . . . and probably due to the anti-weld characteristics of its chemistry. Further, "FATIGUE-PROOF's" pearlitic structure appears to resist sliding wear better than a quenched and tempered structure of equal hardness.

Resistance to fatigue . . . The chief reason for the failure of highly stressed parts is fatigue. While part shape, unfavorable residual stresses, tool marks, gouges in highly stressed areas, and many other factors contribute to fatigue failure, most materials have also an inherent quality . . . endurance limit that is an indication of ability to resist fatigue.

"FATIGUE-PROOF" has this inherent quality to resist fatigue. Laboratory tests prove that fatigue properties are at least comparable to those of expensive heat treated steels of the same strength level. Numerous field tests, under severe operating conditions, have proved this to the satisfaction of many manufacturers.

Dimensional stability... "FATIGUE-PROOF" maintains a high degree of dimensional stability in machining because of its low order of residual stresses.

Details of the e.t.d." process . . . Elevated Temperature Drawing involves (1) the selection of bar chemistry, (2) the amount of reduction in cross-sectional area of the bar as it is drawn through a special die, and (3) a preselected elevated drawing temperature which will result in the desired final properties.

Although the "e.t.d." process was first announced early in 1957, it has been used in the production of "FATIGUE-PROOF" steel bars since September 1955. Four U.S. Patents (Nos. 2,767,835, -6, -7, and -8) were granted October 23, 1956, covering the "e.t.d." process – an exclusive development of La Salle Steel Company.

How manufacturers can obtain sample Fatigue-Proof steel bars for testing

LaSalle Steel Company has announced that samples of "FATIGUE-PROOF" steel bars, made by the "e.t.d." (Elevated Temperature Drawing) process, are available for test purposes on a no charge basis to manufacturers where it appears that "FATIGUE-PROOF" can help improve products and reduce production costs.

Applications for a sample bar are invited from manufacturers making parts from either hot-rolled or cold-finished carbon or alloy steel bars which require high tensile strength.

Interested manufacturers may write for a test sample by sending a blueprint or application details direct to LaSalle Steel Company, Advertising Department, P. O. Box 6800-A, Chicago 80, Ill.

"FATIGUE-PROOF" is also available from your steel distributor . . . write for his name.

Brochure tells story of Fatigue-Proof steel bars

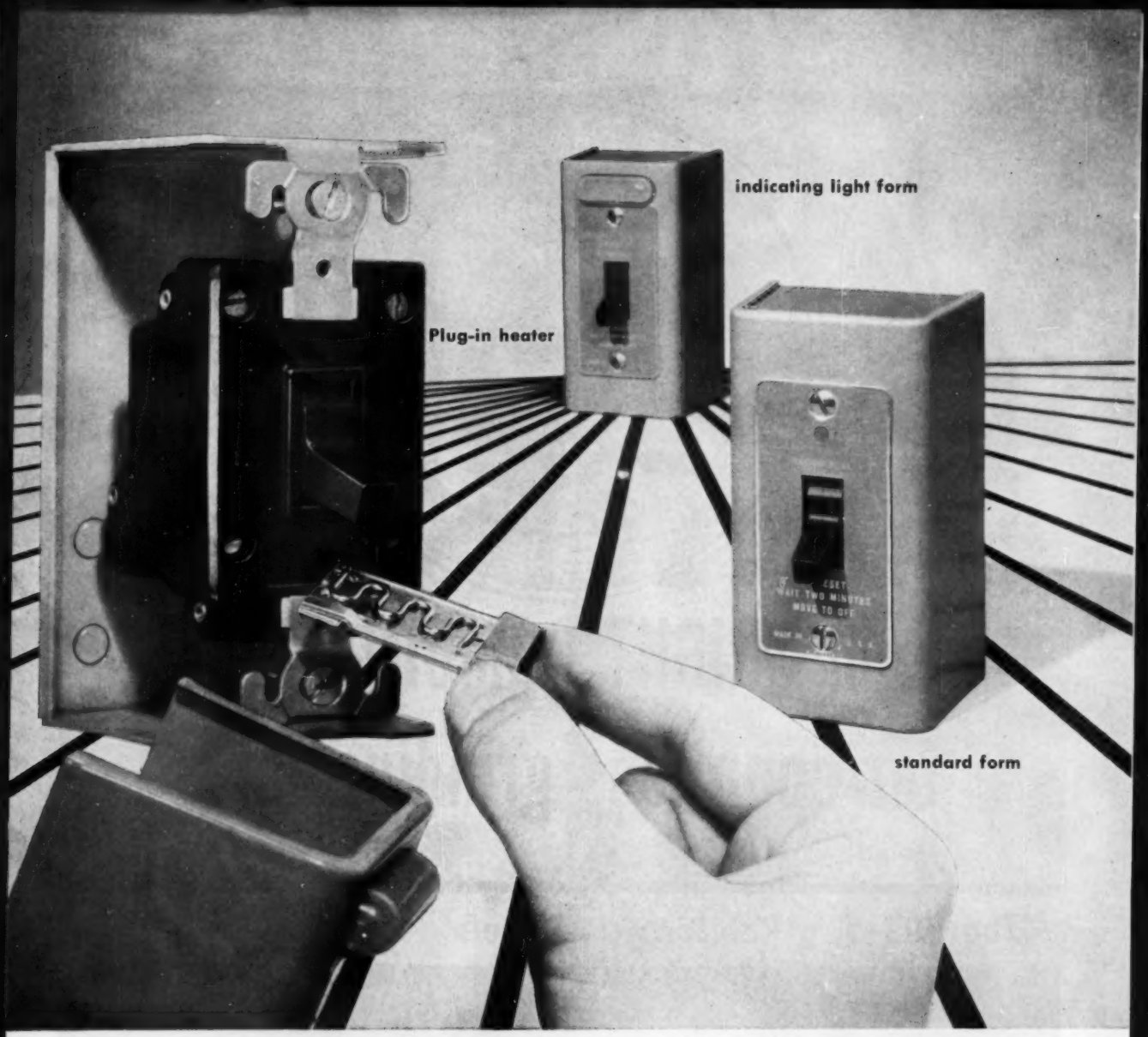
"A New Material" is the title of a 24-page booklet which gives detailed information covering La Salle "FATIGUE-PROOF" steel bars made by the Elevated Temperature Drawing process.

The booklet presents the results of more than one year's tests of production samples and reports on eight application case studies. Copies available on request.

TM—Trademarks of La Salle Steel Company

La Salle STEEL CO.

1416 150th STREET
HAMMOND, INDIANA



PLUG-IN HEATER, SMALLER SIZE WITH . . .

New General Electric Manual Starter

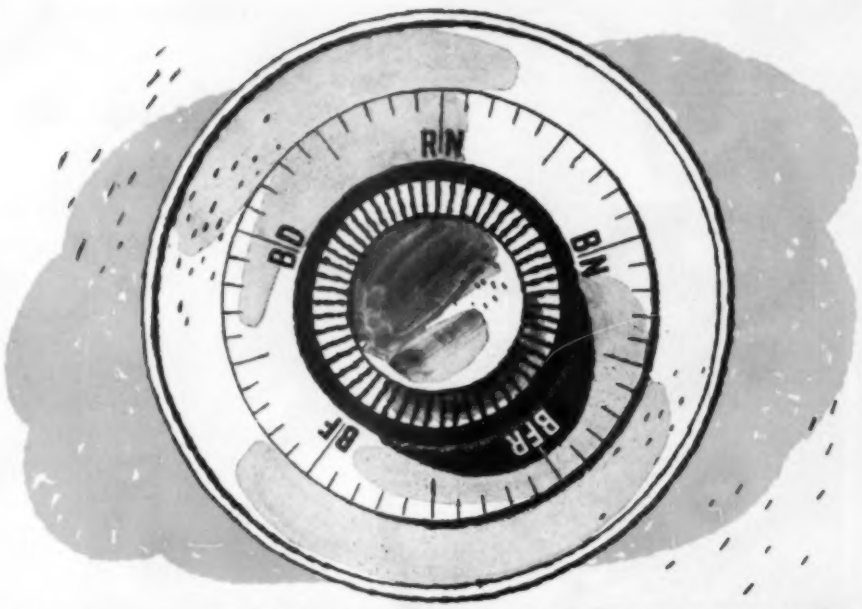
You can install or change the heater in the new General Electric manual starter in a matter of seconds. Simply remove the wrap-around cover, and insert the heater. The heater plugs in from the front of the starter and is keyed so it can't possibly be inserted the wrong way.

NEW SMALLER General Electric manual starter, shown actual size above with cover removed, can be installed in gem or handy boxes. The new neon indicating light form is same size as standard form.

OTHER FEATURES include positive indication of overload. Under overload conditions, the handle moves to mid-position. Fast acting mechanism and dependable fine silver contacts provide long contact life. A new wrap-around cover lifts off to give greater accessibility. Terminal design eliminates wire looping, cuts wiring time.

FOR COMPLETE INFORMATION contact your nearest General Electric apparatus distributor or write advertising section 733-34 for bulletin GEA-6358. General Electric Co., Bloomington, Illinois.

GENERAL ELECTRIC



Your "RIGHT COMBINATION" for countless grinding jobs

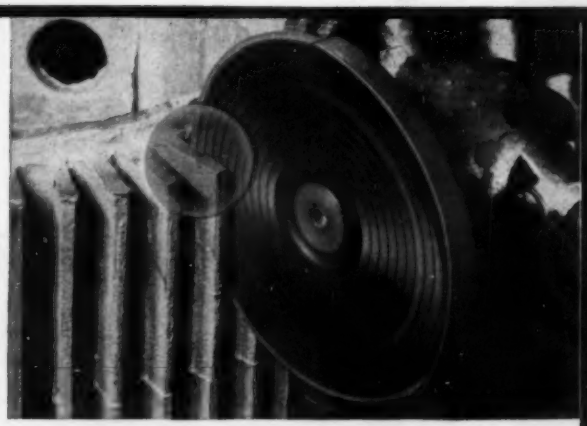
The BIG 5 in Reinforced Wheels

RN WHEELS — Glass Cloth

New — for the foundry and lower priced! Norton has been field-testing a new rubber-bonded-reinforced wheel. It's ready now and well worth your investigation for savings in your cutting-off operations on ferrous and non-ferrous metals.

BN WHEELS — Glass Cloth

Ten inch diameter wheels can now be had 1/16" and 3/32" thick. In this range specify A36TBN. For heavy duty work, requiring larger and thicker wheels, specify A24R14BN. Use them for slotting, for cutting-off non-ferrous metals, wire rope, many non-metallic materials.



BD WHEELS — Glass-Nylon

For fastest cutting on right-angle grinders you'll want the glass cloth reinforced resinoid bonded hub wheels of rigid type. Use for medium to heavy weld grinding and smoothing flame-cut edges. Specify A24NBD for fast cut, A24QBD for long life. For cutting-off, A24RBD which is Nylon reinforced.

BFR WHEELS — Cotton-Nylon

Top performers for light, portable grinding. These semi-flexible resinoid wheels have cotton fabric with an additional layer of Nylon for added safety. Specify A24KBFR for weld smoothing, removing scale, light finishing, minor cut-off jobs, etc.

Norton Reinforced Wheels are built in many different varieties . . . to add the "TOUCH OF GOLD" in many different ways

There's no limit to what the complete line of Norton reinforced wheels can do for you, in the widest range of everyday grinding jobs — from light deburring to heavy cutting-off.

That's because each type combines exactly the right abrasive, reinforcing web and bond to assure exceptional strength and safety — plus fast, cool, trouble-free performance. Remember: only Norton offers you such long experience in both grinding wheels and grinding machines . . . which means these particular wheels are sure to bring you the money-saving, value-adding "Touch of Gold" on job after job, day after day.

Also, Reinforced Mounted Wheels and Sticks are available. Here we show just five of the popular reinforced wheel types. For plenty of further facts, read our Booklet No. 1748. Get it from your Norton distributor — together with fast, helpful service. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

BF WHEELS — Cotton

These resinoid straight wheels with cotton fabric reinforcement are "the right combination" for peripheral grinding, do a fine job of deburring and finishing. Fine for blending and smoothing light welds. Also available in mounted wheels and sticks.

W-1814

NORTON

ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS

Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING DIVISION

Coated Abrasives • Sharpening Stones • Behr-cat Tapes

Stainless Steel
forging information

*Watch temperatures—avoid cracks

Accurate control of heating is the most important consideration in forging Stainless Steel. Each Stainless grade has its optimum preheat range, its ideal starting and finishing temperatures and its best cooling rate. There are wide variations in these from grade to grade, so it's wise to set up tight preheat, working and cooling procedures with the emphasis on accurate control.

In this limited space we want to stress slow, uniform heating. This should include thorough soaking in the preheat range followed by slow heating to working temperature. Heating too rapidly almost always means splitting or surface cracks caused by a cold interior. Remember too that Stainless Steels can be hot-worked only in a relatively narrow (300-500°F.) range.

For complete information on Stainless Steel forging, or any other fabricating process, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa., for our fact-packed book, "Fabrication of Stainless Steel."

United States Steel photograph made at Portland Forge & Foundry Co., Portland, Indiana

United States Steel Corporation, Pittsburgh
American Steel & Wire Division, Cleveland
Columbia-Geneva Steel Division, San Francisco
National Tube Division, Pittsburgh
Tennessee Coal & Iron Division, Fairfield, Ala.
United States Steel Supply Division, Warehouse Distributors
United States Steel Export Company, New York

USS

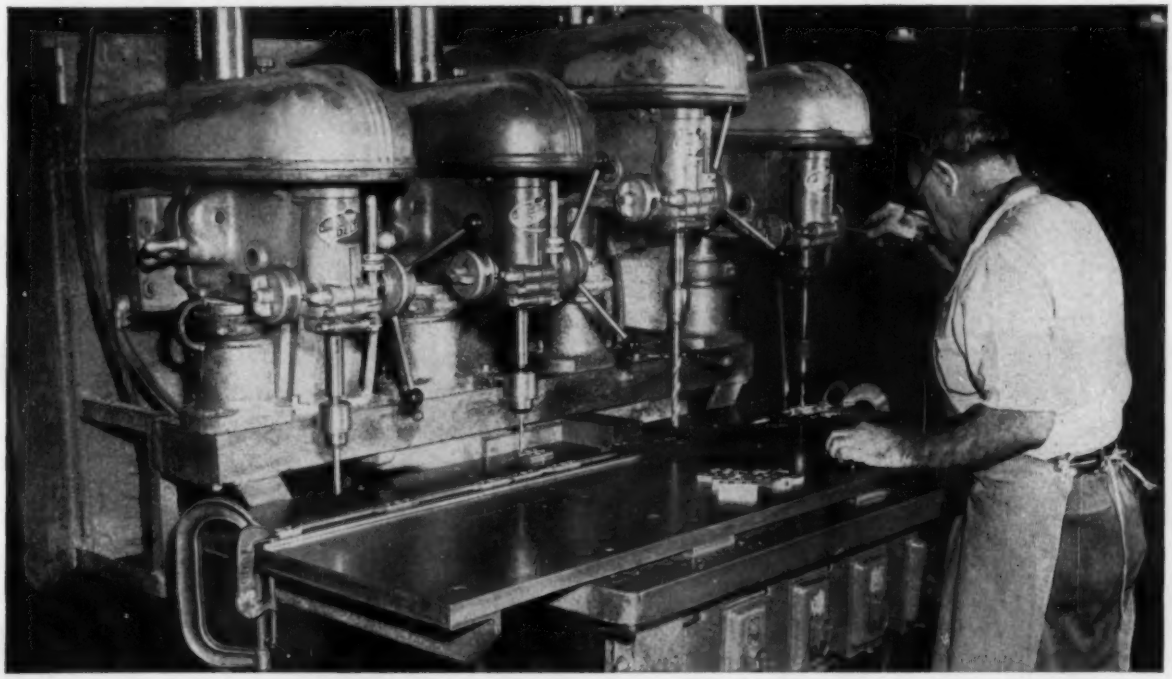
USS STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS
PIPE · TUBES · WIRE · SPECIAL SECTIONS

UNITED STATES STEEL

ROCKWELL-BUILT

DELTA drill presses



. . . save cost of expensive machines

for General Bronze Corp., Garden City, N. Y.

FLEXIBILITY NEEDED—"Producing custom ornamental metal work for architectural use calls for limited production runs and fast product output," says Joe Gafney, Plant Engineer, "and Delta drill presses give us maximum flexibility to meet these constantly changing production demands."

PRECISION AT LESS COST—This Delta drill press set up drills, countersinks and counterbores over 500 bronze window blocks per day, with precision that eliminates costly rejects. And stock Delta power tools provide an inexpensive way to meet peak work loads and prevent bottlenecks.

LONG LIFE, LOW MAINTENANCE—"We have some Delta equipment that has been in regular use for over 15 years," says Mr. Gafney, "and still performs with almost no maintenance. Rugged construction and low-cost maintenance are Delta Quality features we really appreciate."

SEE THE ENTIRE DELTA LINE—Get all the facts on the world's most complete line of drill presses and accessories. Compare for quality, for value—and make up your own mind. Your Delta Dealer is listed under "TOOLS" in the Yellow Pages of your telephone book.

Send Coupon for All the Facts!

another product by ROCKWELL

Delta Power Tool Div., Rockwell Manufacturing Co.
618L N. Lexington Ave., Pittsburgh 8, Pa.

- ☐ Please send catalog on entire Delta Drill Press line.
- ☐ Please send booklet: Power Tools Teamed with Machine Tools.
- ☐ Please send names of my nearest Delta Dealers.

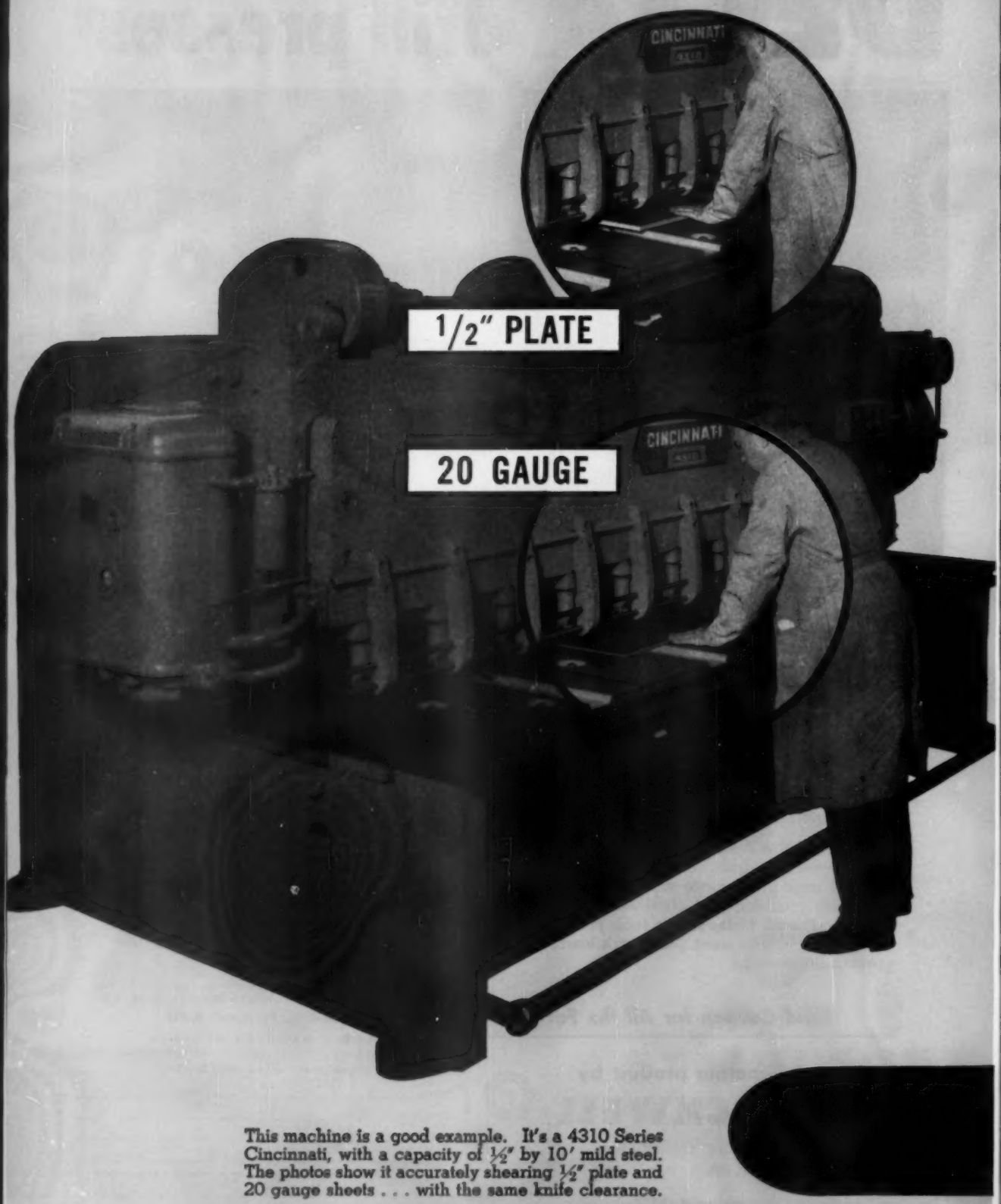
Name_____ Title_____

Company_____

Address_____

City_____ County_____ State_____

CINCINNATI



This machine is a good example. It's a 4310 Series Cincinnati, with a capacity of ½" by 10' mild steel. The photos show it accurately shearing ½" plate and 20 gauge sheets . . . with the same knife clearance.

accurately shears thin sheet and heavy plate...

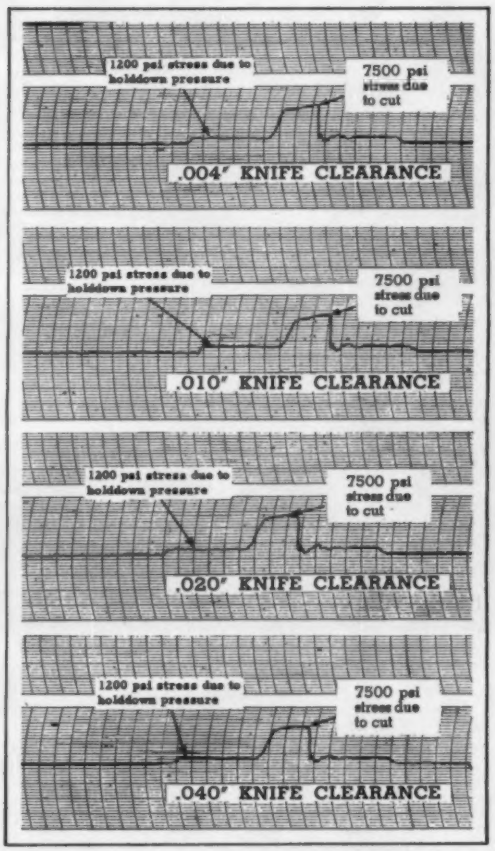
without changing knife clearance!

You don't have to change knife clearance each time you cut a different thickness on a Cincinnati Shear. With the knife clearance set for thin material, Cincinnati Shears will accurately cut all thicknesses up to capacity.

This statement is being demonstrated daily, by the thousands of Cincinnati Shears in operation. Carefully conducted engineering tests have proven the following facts:

- Knives last just as long when cutting different thicknesses with one knife clearance, as when clearance is changed for each thickness.
- A Cincinnati Shear works no harder when cutting with a close clearance than it does with a large clearance.
- Shearing with one knife clearance is safe, since thin sheets cannot become accidentally wedged between the knives.
- Cincinnati Shears with single knife clearance are time-savers, since the unnecessary clearance-changing operation is eliminated.

The results of two of these tests are shown at the right. For complete information on Cincinnati All-Steel Shears, write Department A for Catalog S-7R.

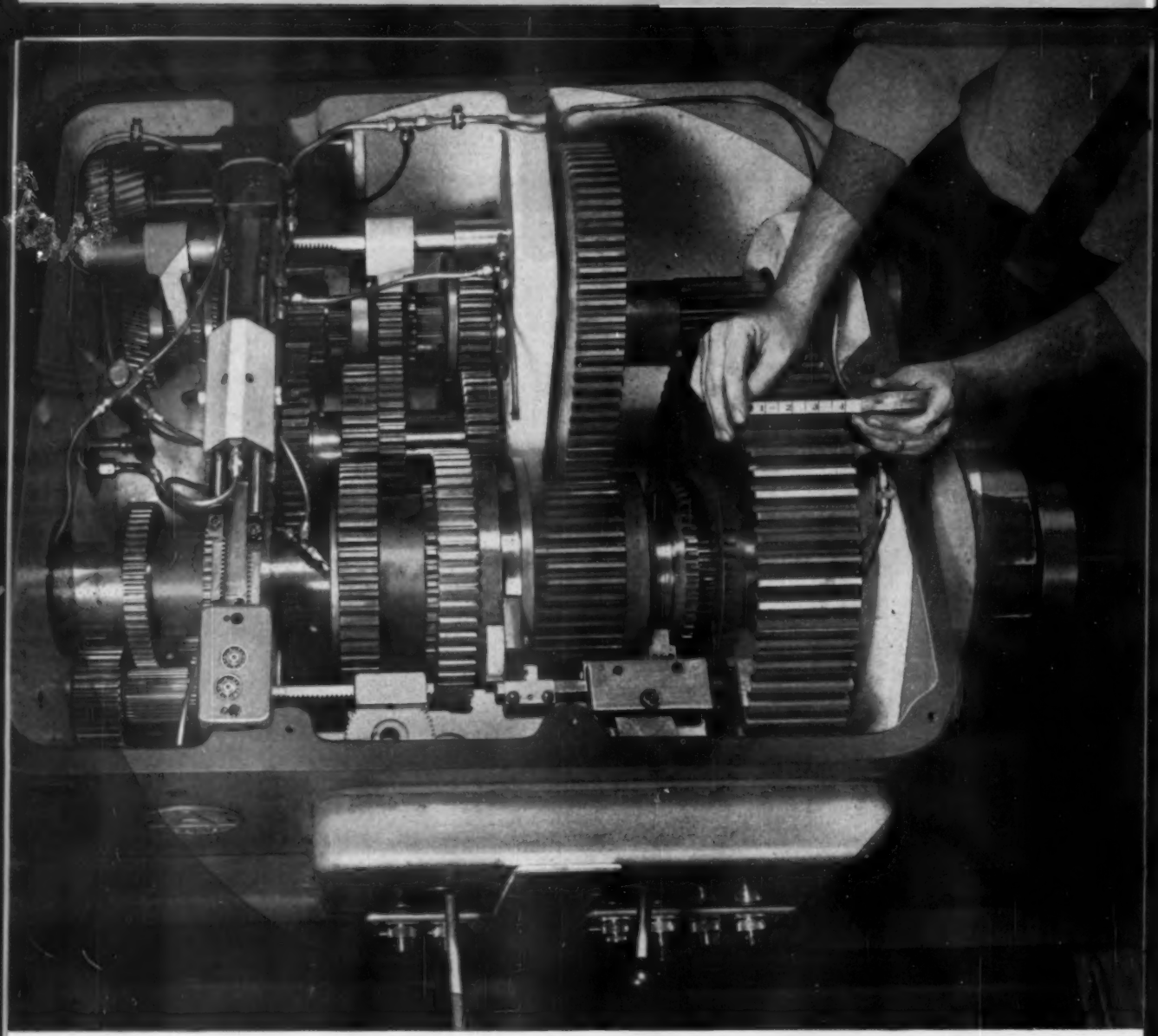

1200 psi stress due to holddown pressure
7500 psi stress due to cut
.004" KNIFE CLEARANCE
1200 psi stress due to holddown pressure
7500 psi stress due to cut
.010" KNIFE CLEARANCE
1200 psi stress due to holddown pressure
7500 psi stress due to cut
.020" KNIFE CLEARANCE
1200 psi stress due to holddown pressure
7500 psi stress due to cut
.040" KNIFE CLEARANCE

These tests show stress in a Shear frame when cutting heavy material, using different knife clearances. They prove that cutting pressure is not affected by knife clearance.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS · SHEARS · PRESS BRAKES

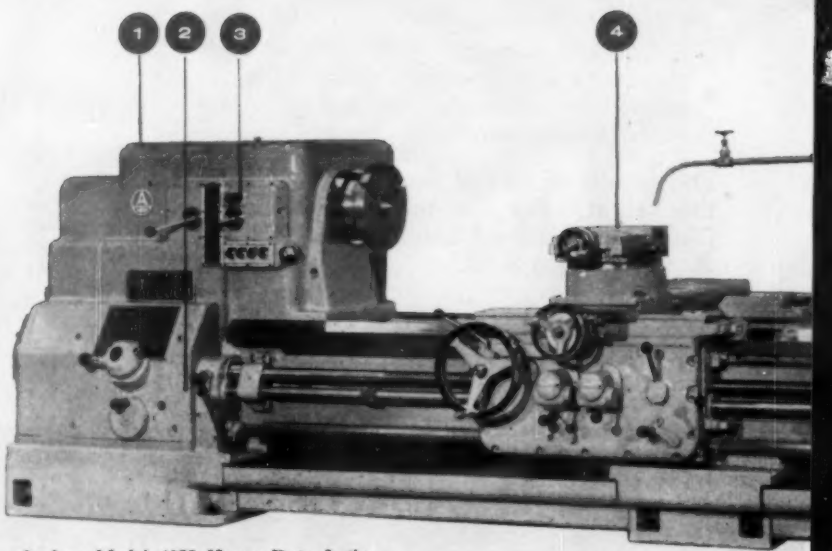
CINCINNATI



1. *The 24-speed headstock, designed to operate at 75 horsepower, will withstand peak loads of more than 100 horsepower. Spindle speeds are divided in true geometric progression from 6 to 750 r.p.m.*

2. *Totally enclosed gear box provides 81 feeds and 45 leads.*

3. *Two levers control speed selection, which is completely mechanical. Built-in horsepower meter is clearly readable from all operating positions.*



Axelson Model 4025 Heavy Duty Lathe.

100-Horse POWERFUL

Here's power-packed precision. Compare the massive 19.900″-diameter 4″-face bull gear pictured at the left – and every other part of Axelson's new 4025 Heavy Duty engine lathe – you'll find that here is the greatest productivity per dollar invested in the machine tool field today.

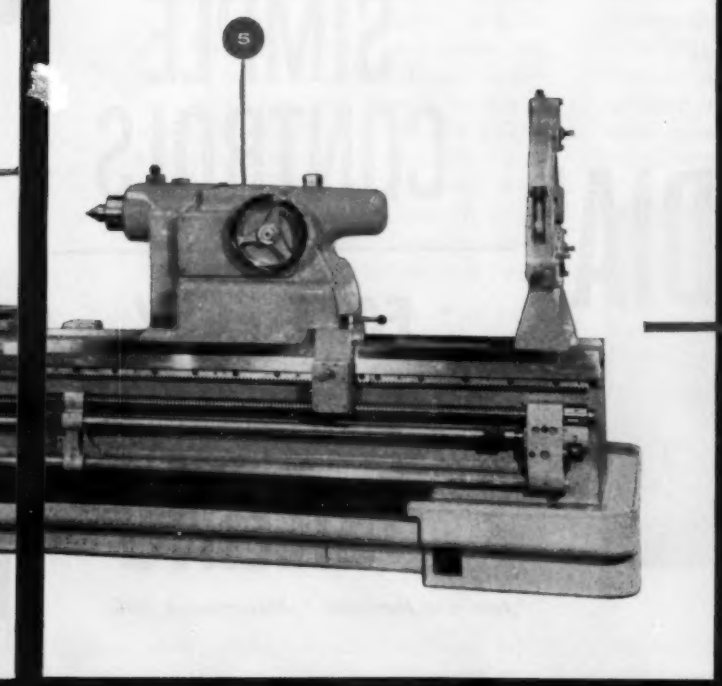
Swinging 40″ over the bed and 25″ over the cross slide, this handsome workhorse is powered by a 75-horsepower motor capable of delivering more than 100 horsepower under peak loads.

Two levers on a new totally-enclosed gear box are used in the selection of 81 feeds and 45 leads. Twenty-four spindle speeds are divided in true geometric progression from 6 to 750 r.p.m.

The main bed casting is girth designed with heavy longitudinal side ribs, center rib, and inverted-V cross ribs to insure the extreme rigidity required for new carbide and ceramic tooling. Replaceable hardened and ground alloy steel ways preserve original accuracy.

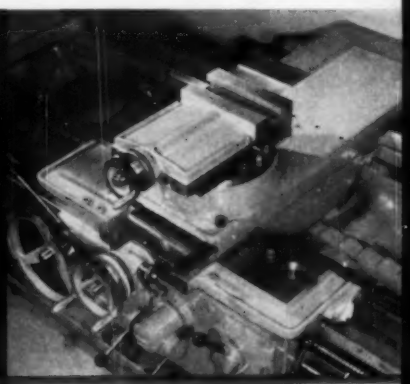
For complete details on the new 4025 Heavy Duty, or any Axelson lathe, call your nearest Axelson representative or write for Bulletin **MA11-5504.**

AXELSON MANUFACTURING COMPANY
Division of U. S. Industries, Inc.
6160 South Boyle Ave., Los Angeles 58, California



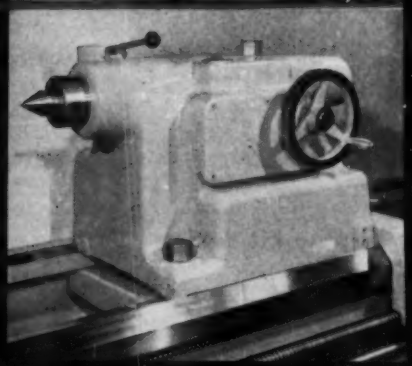
4

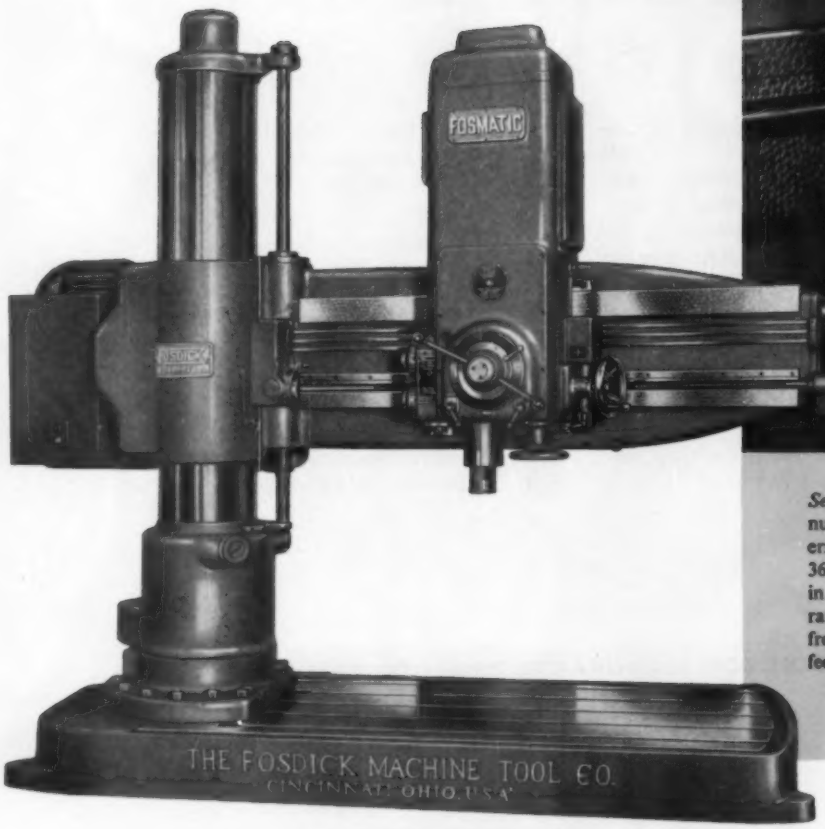
Cast steel compound is capable of extended travel. Apron is extra-heavy box-type design, completely enclosed so all shafts and gears operate with automatic pressure lubrication.



5

Solid one-piece tailstock eliminates inaccuracies that might be caused by bolt stretch. Two-speed tailstock spindle provides 18″ travel.





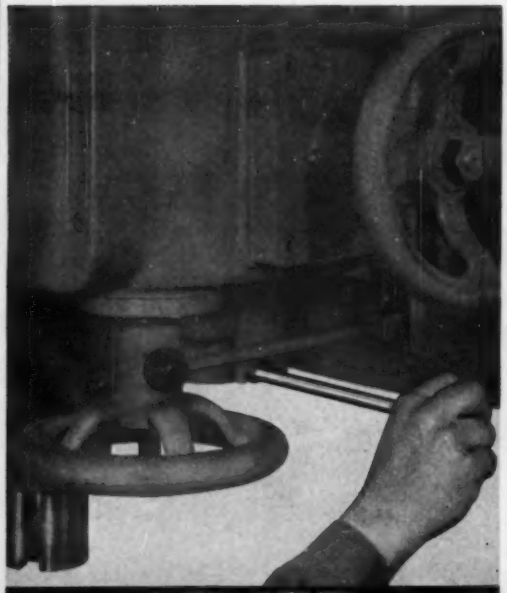
DIALS

Select feeds and speeds with easy-to-read numerical dials. Minimum possibility of error. To save time, select while drilling. 36 spindle speeds, maximum 3000 rpm, in variety of ranges, each with 127.5 to 1 ratio. 18 feeds, including 6 tap leads, from .003" to .125". Electronic milling feeds are also offered—from ¾ to 15 ipm.

FOSMATIC RADIAL

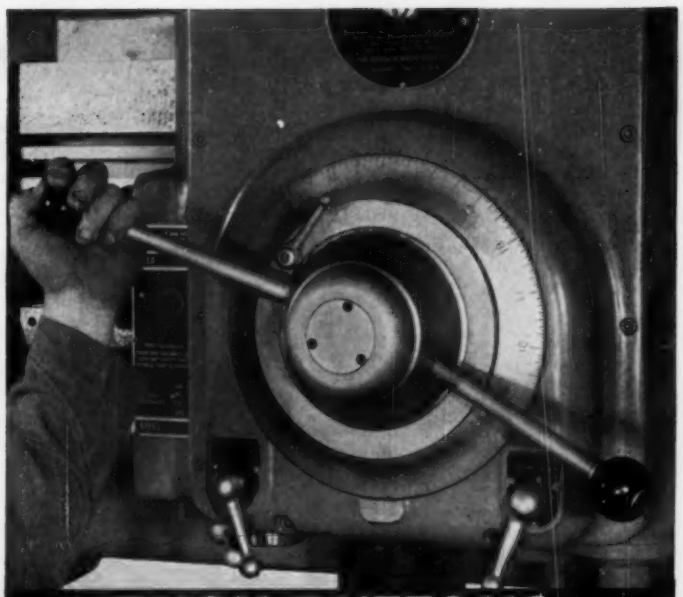
SIMPLE CONTROLS

FAST, EASY PRECISION DRILLING



LEVER

Shift, start, stop and reverse with single lever. Shifting to new feeds and speeds is accomplished by raising lever slightly in its neutral position. For faster tapping, reverse spindle speed is up to 40% faster than forward speed.



PUSH BUTTONS

Engage feed by pressing button on either quick-return handle. Feed is disengaged by depth control or by pressing either button again. Feed dial is graduated to full spindle travel, to eliminate resetting for deep holes. Powerful magnetic clutch which engages feed will never need adjusting. Head and column can be clamped automatically when feed is engaged, if desired. They are unclamped by independent levers.

Fast, rigid, precise, easy to run—that's what today's machine shop demands in a radial. And that's what makes the Fosmatic outstanding among radial drills. The simple controls shown here save valuable seconds of operator's time, with each hole drilled. Other convenient controls at the head—single lever to raise and lower arm (hydraulic clamp interlocked) and traverse head; hydraulic column clamp; hand feed and traverse to head; tool ejector eliminates need for tang driver.

The new boring-type spindle is of heavy section with bearings placed far apart for extreme rigidity; it can be used for boring, milling and the heaviest drilling. A new and unique counterbalance produces equal tension on the spindle whether it is extended or close to the head. Case-hardened gears are ground on the finest equipment available. They run on ground splined shafts which are mounted in ball bearings. Lubrication is automatic.

Our new arm is the strongest in the business. It has a double box section with very heavy walls; ways have been widened considerably. The head is mounted on roller bearings on hardened and ground ways with an additional roller support in back of the arm. Safety nut is hydraulic. Column is superfinished.

Standard sizes available with 4' to 8' arms, 13" to 19" columns. Write for Catalog RD-A.

CLEEREMAN

"Series A" *Automatic* Drilling and Tapping Machines

producing faster... better... easier... from coast to coast!

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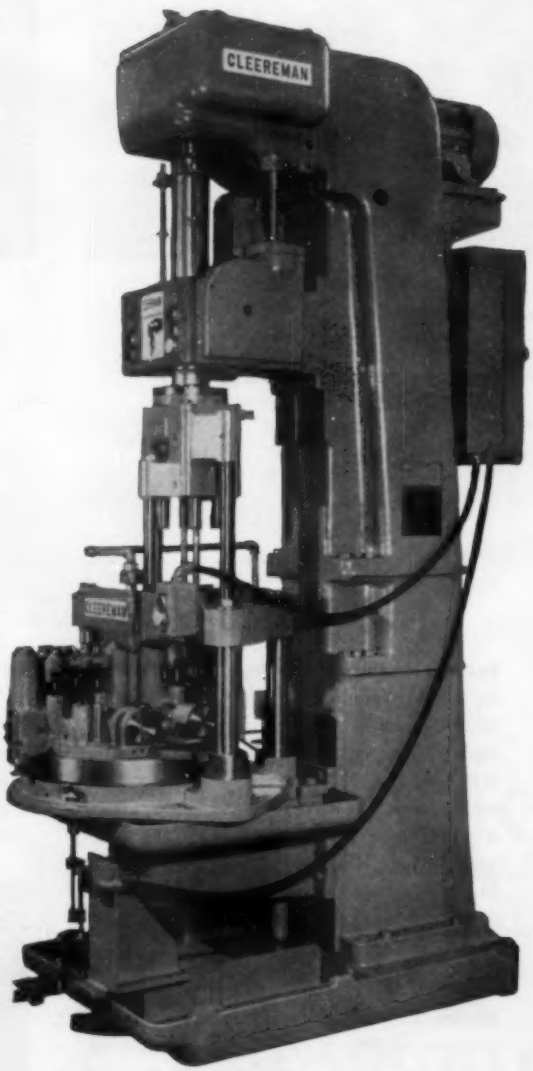

These are a few of the Cleereman "Series A" users who find this "box cycle" automatic Drilling and Tapping Machine the answer to their problems.

Drilling and tapping a hole "at the touch of a button" produces faster, easier and at highest profits. Operators are relieved of handling cumbersome controls. Operator morale is boosted and operator fatigue reduced.

Join the rapidly increasing Cleereman "Series A" users list. This fast set-up production-type drilling and tapping machine has a place in your plant. Don't delay increasing your production efficiency. *Wire*, *write* or *phone* about your jobs right now.

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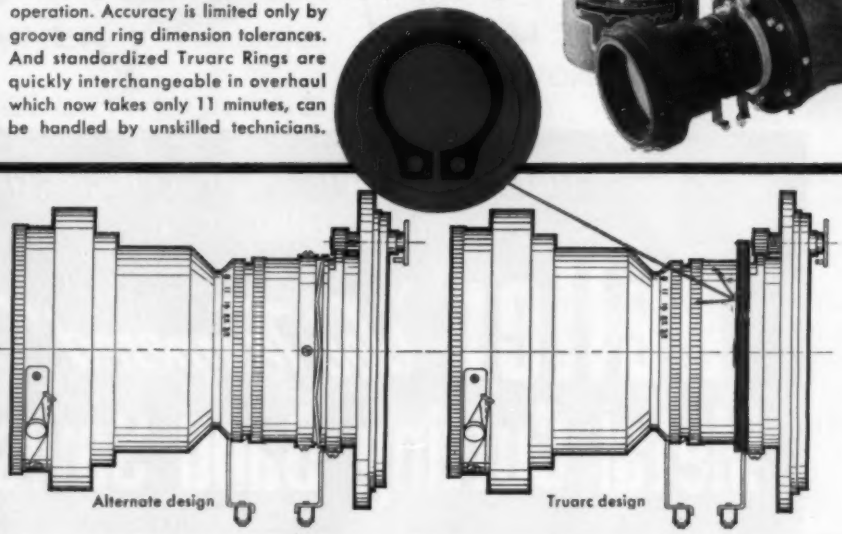
GREEN BAY, WISCONSIN

Waldes Truarc Retaining Ring eliminates 7 parts, saves $8.88 in sub-assembly of aerial reconnaissance camera

Gordon Enterprises, No. Hollywood, California, saved the Navy almost 1½ million dollars on 500 cameras. Gordon rebuilt new, efficient "CA" series out of Navy-owned obsolete models. Critical parts are now held together by Waldes Truarc Retaining Rings.

Truarc Rings are trouble-free, will not change position during operation. Accuracy is limited only by groove and ring dimension tolerances. And standardized Truarc Rings are quickly interchangeable in overhaul which now takes only 11 minutes, can be handled by unskilled technicians.



Truarc 5100-287 ring retains shutter speed adjustment mechanism on the Lens Adapter Plate Assembly which mounts and locks the lens and shutter assemblies accurately to camera body. Alternate design required retaining washer, spring, collar and 4 locking screws.

Weight Saving: 7.25 oz.

Assembly Time Saving: . . . . . 6½ min.

DOLLAR SAVINGS:

Material	**$ .93**
Fabrication	**6.88**
Inspection	**1.07**
Total	**$8.88**

Whatever you make, there's a Waldes Truarc Ring designed to save you material, machining and labor costs, and to improve the functioning of your product.

In Truarc, you get

Complete Selection: 36 functionally different types. As many as 97 standard sizes within a ring type. 5 metal specifications and 14 different finishes. All types available quickly from leading OEM distributors in 90 stocking points throughout the U. S. and Canada.

Controlled Quality from engineering and raw materials through to the finished product. Every step in manufacture watched and checked in Waldes' own modern plant.

Field Engineering Service: More than 30 engineering-minded factory representatives and 700 field men are at your call.

Design and Engineering Service not only helps you select the proper type of ring for your purpose, but also helps you use it most efficiently. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting . . . Waldes Truarc Grooving Tool!

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RETAINING RINGS

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Please send new, descriptive catalog showing all types of Truarc rings and representative case history applications. *(Please print)*

Name .....
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Company .....
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City ..... *Zone* ..... *State* .....

AM115

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

Great in its day...

BUT WOULDN'T YOU
RATHER HAVE
THE LATEST
TECHNICAL ADVANCE?

Now! An important new improvement in metal cutting

Heller "Job Tempered" Metal Cutting Band Saws

Certified by American Standards Testing Bureau* to meet their standards for Superior Cutting — Uniform Teeth... Uniform Set... Uniform Temper

When band saw machines are equipped with the *right* blade from Heller's brand new line of metal cutting band saws they give exceptionally fast clean cuts — at minimum unit cost — on a wide variety of materials and for long service periods.

Users report these better results because *every* Heller blade is JOB TEMPERED. Steel of a special controlled-analysis specified by Heller metallurgists, is heat treated by a unique process *matched to the steel.* This insures uniform temper and cutting qualities that mean unsurpassed performance on the job.

Teeth are made uniform in size, shape and spacing by machines of specialized design — the most modern in the industry.

Uniform set is made absolutely *certain* by a highly sensitive indicator developed for just this purpose.

Because of these improvements in the art of band saw manufacture, American Standards Testing Bureau gives its assurance that Heller's great new line of saws meet their standards for superior cutting:
uniform teeth — uniform set — uniform temper.

Why not put these exceptional blades to work earning for you?

* AMERICAN STANDARDS TESTING BUREAU INC. S TB

HELLER TOOL CO. SINCE 1836

Heller

HELLER TOOL CO., *America's Oldest File Manufacturer*
Newcomerstown, Ohio — A Subsidiary of Simonds Saw and Steel Co.

YOU GET THESE HELPFUL EXTRAS WHEN YOU USE HELLER BLADES

SOLD EXCLUSIVELY THROUGH

Heller DISTRIBUTORS
"YOUR OUTSIDE TOOL ROOM"
Heller "Job Tempered" Tools

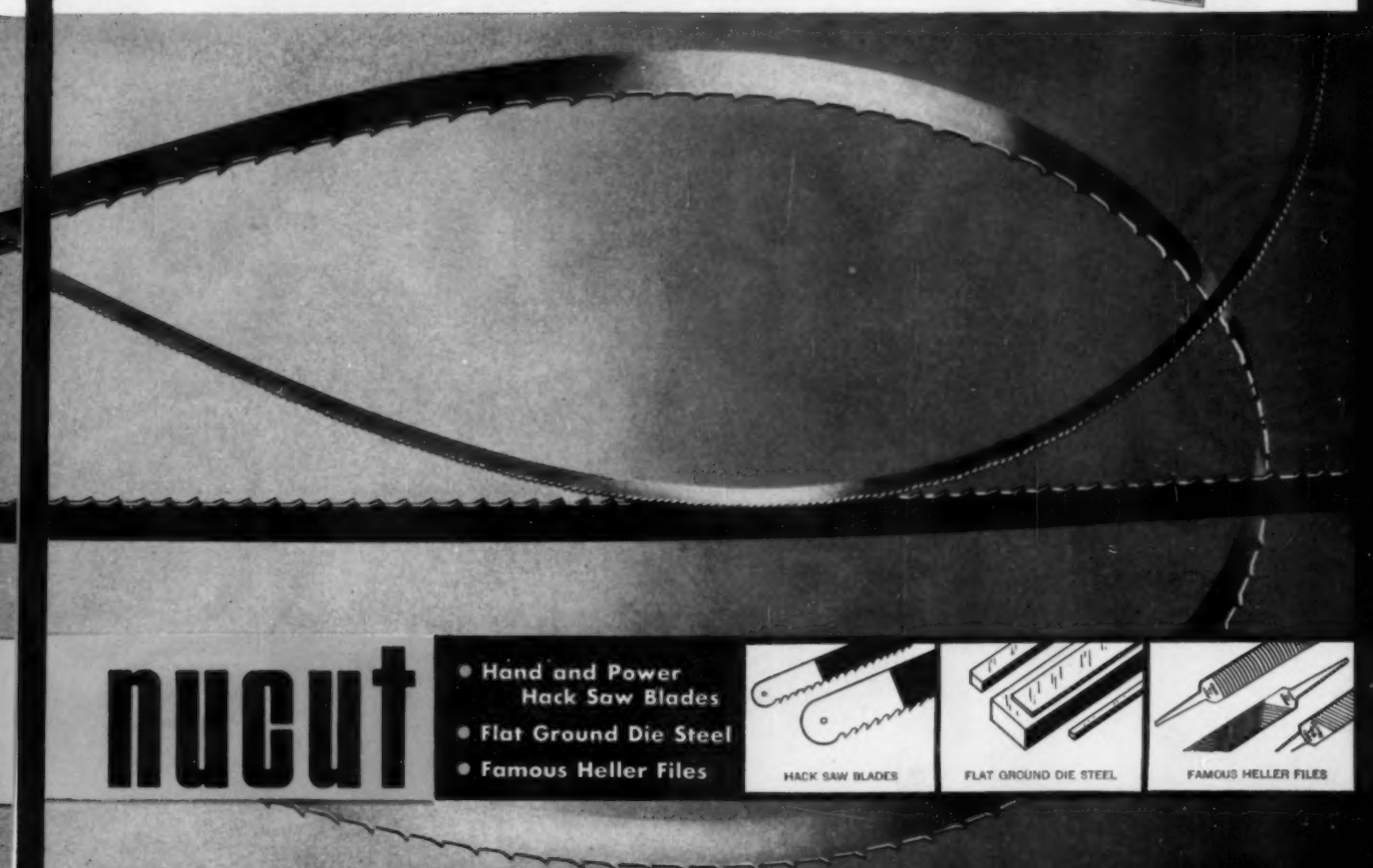
1. COMPLETE SELECTION Heller offers a full selection of "Job Tempered" Metal Cutting Band Saws. You can choose exactly the right tooth shape, set, and blade width in standard or high speed steel as required for your application.

2. CHARTS AND BOOKLETS FOR USERS Your Heller Distributor will furnish you with wall charts and booklets to help you choose the *right* Metal Cutting Band Saw for your applications. These visual aids will show you the speeds and feeds required for best cutting results, for contour cutting or cutoff work.

3. CONVENIENT PACKAGING Heller's packaging is designed for maximum user convenience. Blades come in bulk lengths of 100′ and 250′ coils so you can cut and weld the length you need when you need it. Or individually packaged blades are furnished cut and welded to fit all standard machines.

HERE ARE THE FACTS! Heller's new catalog of "Job Tempered" Metal Cutting Band Saws contains descriptions of all types of blades, tooth shapes, set, applications.

WRITE FOR YOUR COPY TODAY!



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- Hand and Power Hack Saw Blades
- Flat Ground Die Steel
- Famous Heller Files

HACK SAW BLADES

FLAT GROUND DIE STEEL

FAMOUS HELLER FILES

ARMSTRONG

Drop Forged CLAMPS

LEADERS IN THE DROP FORGED CLAMP FIELD . . . in design, machining and strength; in completeness of line in both sizes and types.

Designs are based on a full knowledge of clamp uses and requisites. Drop forging assures die-perfect form, texture toughness and freedom from structural faults. Maximum stiffness is attained by a discerning selection of steels with accurate controlled heat-treating, tempering and testing.

For dependability and long useful life, specify and standardize on ARMSTRONG Drop Forged Clamps.

EXTRA DEEP THROAT "C" CLAMPS

Provide extra clearance required for some work. Extremely stiff for weight. Screws and hubs are accurately machined and aligned with machined seats; have sliding pin handles and free-acting swivel caps on point. Bodies have smooth sandblast finish.
(8 sizes to 12" opening)

Write for new ARMSTRONG General Catalog showing almost 5000 industrial tools.

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HEAVY DUTY "C" CLAMPS

Universally recognized as strongest "C" clamps made. Longer hub holds screw alignment against terrific side strain; permit tighter clamping and multiplies thread friction against loosening. Extra large screws are heat treated and hardened at point.
(11 sizes to 12½" opening)

MEDIUM SERVICE "C" CLAMPS

The design and careful selection of steels in this type clamp combine to give it maximum strength and stiffness consistent with convenient weight. Heat treated screw with sliding pin handle and swivel cap on point. Ground seat.
(9 sizes to 18" opening)

TOOL MAKERS "C" CLAMPS

Quality steels, drop forged, heat treated and accurately machined with ground seats. Drop forged screws have both "wing nut" handle for convenience and square necks for tight setting with a wrench. Either "plain" or "swivel" screw types.
(Four sizes: 1", 2", 3" or 4" maximum opening)

SPATTER RESISTANT WELDERS "C" CLAMPS

Extra Deep Throat Pattern (see above). Body, Swivel and Screw are cadmium plated over all to resist welding spatter.
(8 sizes Capacities to 12" opening)

MACHINISTS' CLAMPS

Jaws drop forged, carefully machined and hardened, are extra heavy; will not bend or spring on a short bite and are faced true. Will grip non-parallel surfaces because the under face of the center screw is convex, fitting into a concave seat for tilting.
(Four sizes: Capacities to 4¼" opening)

PARALLEL CLAMPS

Carefully machined from selected grade steel and hardened. Particularly suited for holding work together when drilling or tapping. Rounded jaw ends increase clearance in close quarters. Spring clip holds loose pin in alignment while tightening or loosening.
(3 sizes: Capacities to 2½" opening).

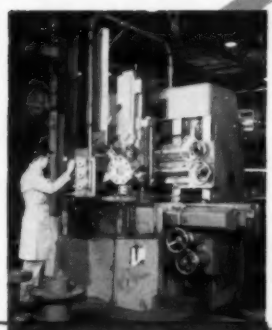
(Not Drop Forged)

no need for Obsolescence with

BULLARD

VERTICAL TURRET LATHES

Model 75



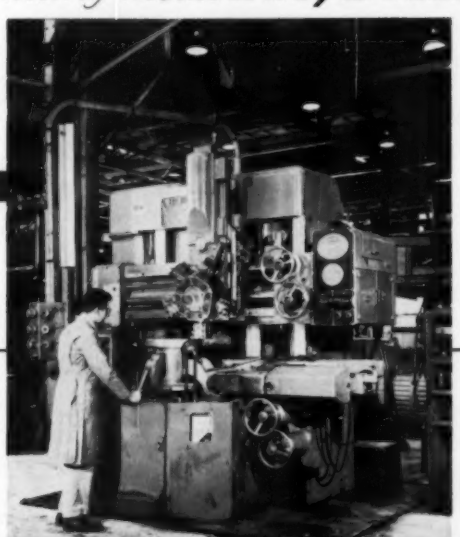
36" Bullard Cut Master V.T.L., Model 75 manually controlled from Pendant Control.

Bullard Service Engineer guides Man-Au-Trol Conversion Unit into place.

Electrical connections for Man-Au-Trol are wired into Cut Master Control Panel.

In May, 1955, Hyster Company, Peoria, Illinois, installed a 36" Cut Master V.T.L., Model 75 and by the end of 1956 it was evident that due to increased requirements an automatically controlled machine was necessary. *Did this obsolete the Cut Master?* — No sir — it only meant adding a Man-Au-Trol Conversion Unit to Cut Master *right in their plant. And it was accomplished in only four days.* No need to obsolete Bullard Cut Master, Model 75 — just convert them.

another way to cut costs when cutting metal — **buy BULLARD**



Man-Au-Trol installed for automatic control of Turret Head.

For the complete information on Bullard Vertical Lathes call our nearest Sales Office or Distributor.

THE BULLARD COMPANY

BRIDGEPORT 9, CONNECTICUT

There's a Good Reason why

ZINC DIE CASTINGS

are so widely used . . .

at *Swingline*

IT'S FLEXIBILITY

TWO DIFFERENT MODELS OF THE SAME MACHINE FROM THE SAME DIE!

—including inserts, mounting studs, holes and projections that save so much time in assembly.

Both of these housings for the SWINGLINE feather-touch electric stapler were made in the same die by using a cut-off section to eliminate the long anvil of the standard model. The short stapler is for industrial, laundry and dry-cleaner use.

This FLEXIBILITY of die casting with ZINC offers a great variety of time-saving and money-saving advantages — almost certainly some that can be applied to your products. See your die caster and get his advice.

THE NEW JERSEY ZINC COMPANY

160 FRONT STREET • NEW YORK 38, N.Y.

HORSE HEAD PRODUCTS

Namco VERS-O-TOOL

lets you use the same head – two ways

- with chasers . . . (for threading)
- with cutters . . . (for hollow milling)

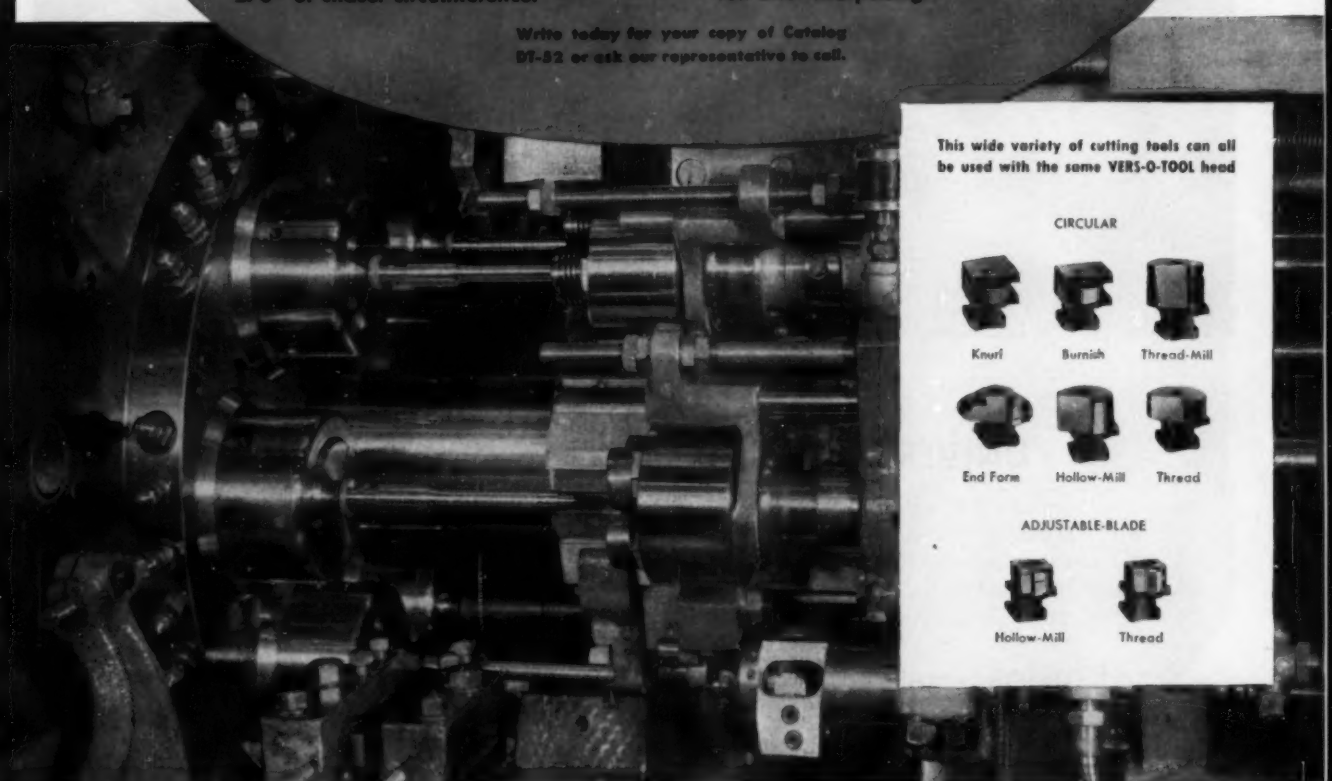
CIRCULAR CUTTING TOOLS reduce costs and speed production on threading jobs, end forming and turning.

GROUND THREAD CHASERS provide more threads per grind—and you can regrind to a full 270° of chaser circumference.

BASIC DESIGN SIMPLICITY—fewer moving parts—insures long, trouble-free performance.

NAMCO CHASER GRINDING SYSTEM permits cutter settings to be made in the toolroom without head adjustments—no need for trial error run after sharpening.

Write today for your copy of Catalog DT-52 or ask our representative to call.



This wide variety of cutting tools can all be used with the same VERS-O-TOOL head

CIRCULAR

Knurl | Burnish | Thread-Mill

End Form | Hollow-Mill | Thread

ADJUSTABLE-BLADE

Hollow-Mill | Thread

Three Namco VERS-O-TOOLS, on this 1¼" RA-6 Acme-Gridley Bar Automatic, hollow mill the stem and cut 2 thread diameters on cast bronze valve stem.

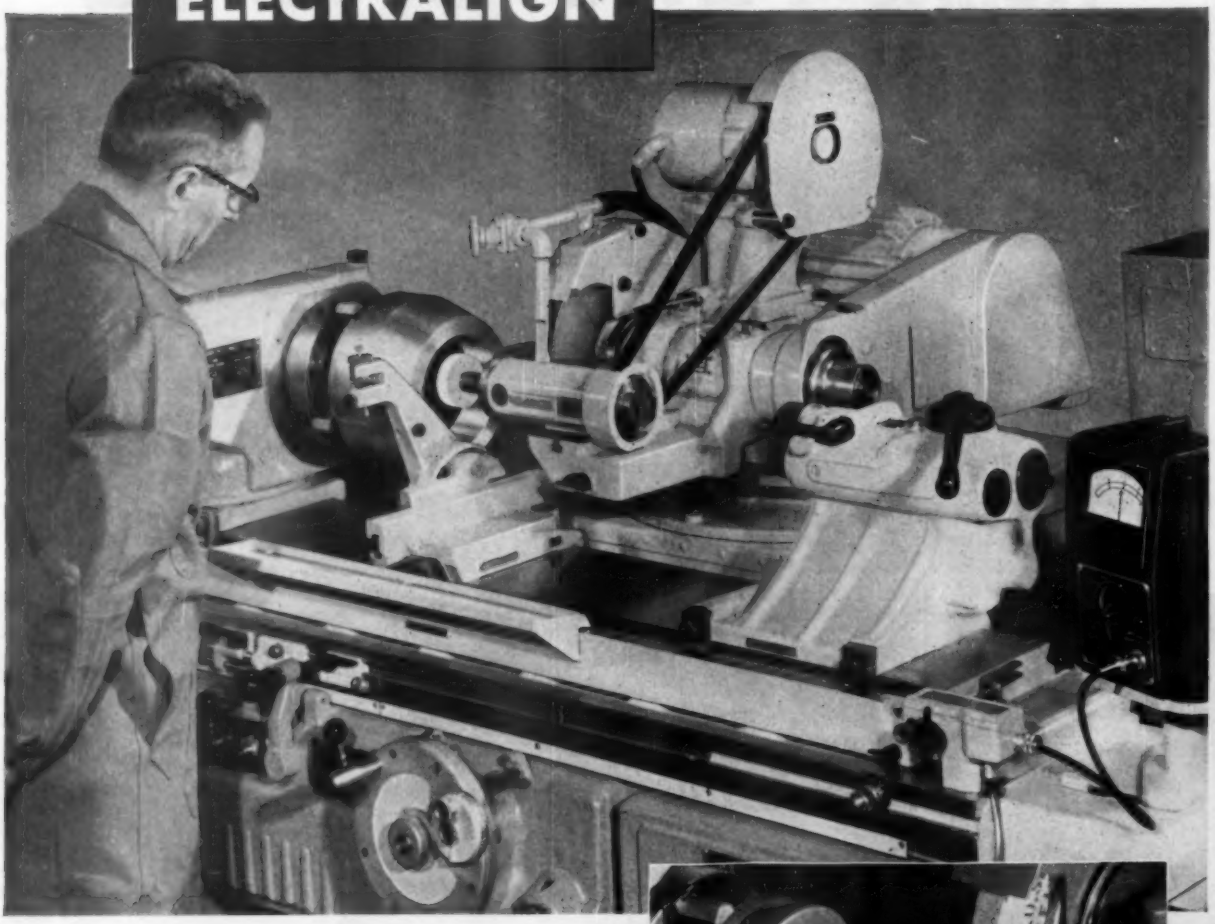
National Acme

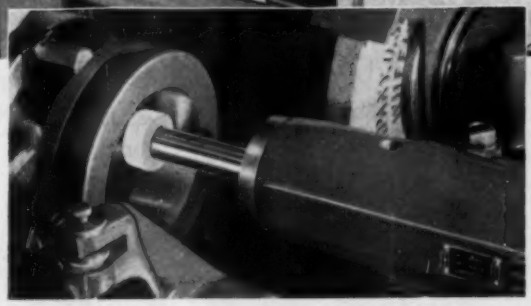
THE NATIONAL ACME COMPANY, 171 E. 131ST ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.

Brown & Sharpe

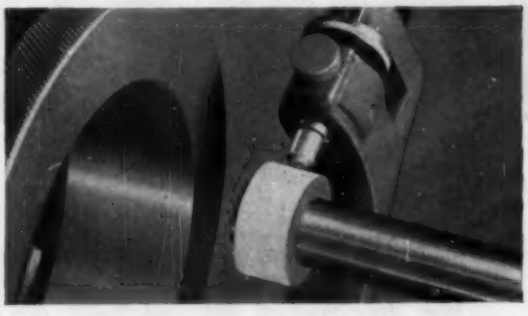
ELECTRALIGN

Takes over MORE





Set-diamond internal wheel-truing attachment requires only one set-up at start of job. Stays on machine. Swings out of way during grinding—swings back for subsequent dressings.



Brown & Sharpe UNIVERSAL GRINDERS

with ELECTRALIGN — and many other exclusive operating advantages — are setting cost-reduction records in toolroom and prototype operations and for many production grinding jobs. Four machine sizes. Write for details.

- **Completely Universal Wheel Spindle Head on Turret** for maximum rigidity, extra capacity, extended work range.
- **Set-Diamond Wheel-Truing Attachment for Internal Grinding** automatically re-establishes size after each truing.
- **Power and Hand Cross Feed in Both Directions** for internal and external grinding to a common, positive stop.
- **Power Cross Feed Continuous to Finish Diameter Setting** Brings feed up to direct contact with positive stop by power, for accurate sizing. Eliminates need for finish sizing by hand feed.

of the operator's task...

saves 60% or more in set-up time

"*How much* time does it save the operator?" That's the true test of the ELECTRALIGN or any comparable device.

ELECTRALIGN is the original electronic aligning device for grinding machine swivel tables. It has a 10-year record of proved savings of 60% or more, for all types of cylindrical and taper grinding, on work to limits of 10ths or less.

For comparable savings, you need *all* the features you can get only in ELECTRALIGN . . . the exclusive *single-setting* alignment and other advantages that *fully* relieve the operator of the need for calculations and repeated adjustments.

Why settle for less? Get the full story of ELECTRALIGN grinding and see why it's the time-proved standard for speed, simplicity, and precision. Brown & Sharpe Mfg. Co., Providence 1, R. I.

Only **ELECTRALIGN** permits instant ALIGNMENT with a SINGLE SETTING

PROVIDES INSTANT ALIGNMENT to 0.0001" or less after **only one** preliminary grind . . . **without calculations.** Operator sets dial to working length of piece and adjusts pointer to show taper error. He then swivels table until pointer reads zero, and grinds to finish — with practically full tolerance for sizing.

AUTOMATICALLY COMBINES AND AMPLIFIES the electrical signals from the measuring elements at **both ends** to give **one** easily-read meter deflection proportioned to the angular movement of the swivel table only. Operator is relieved of need to compensate for deviation at each end individually.

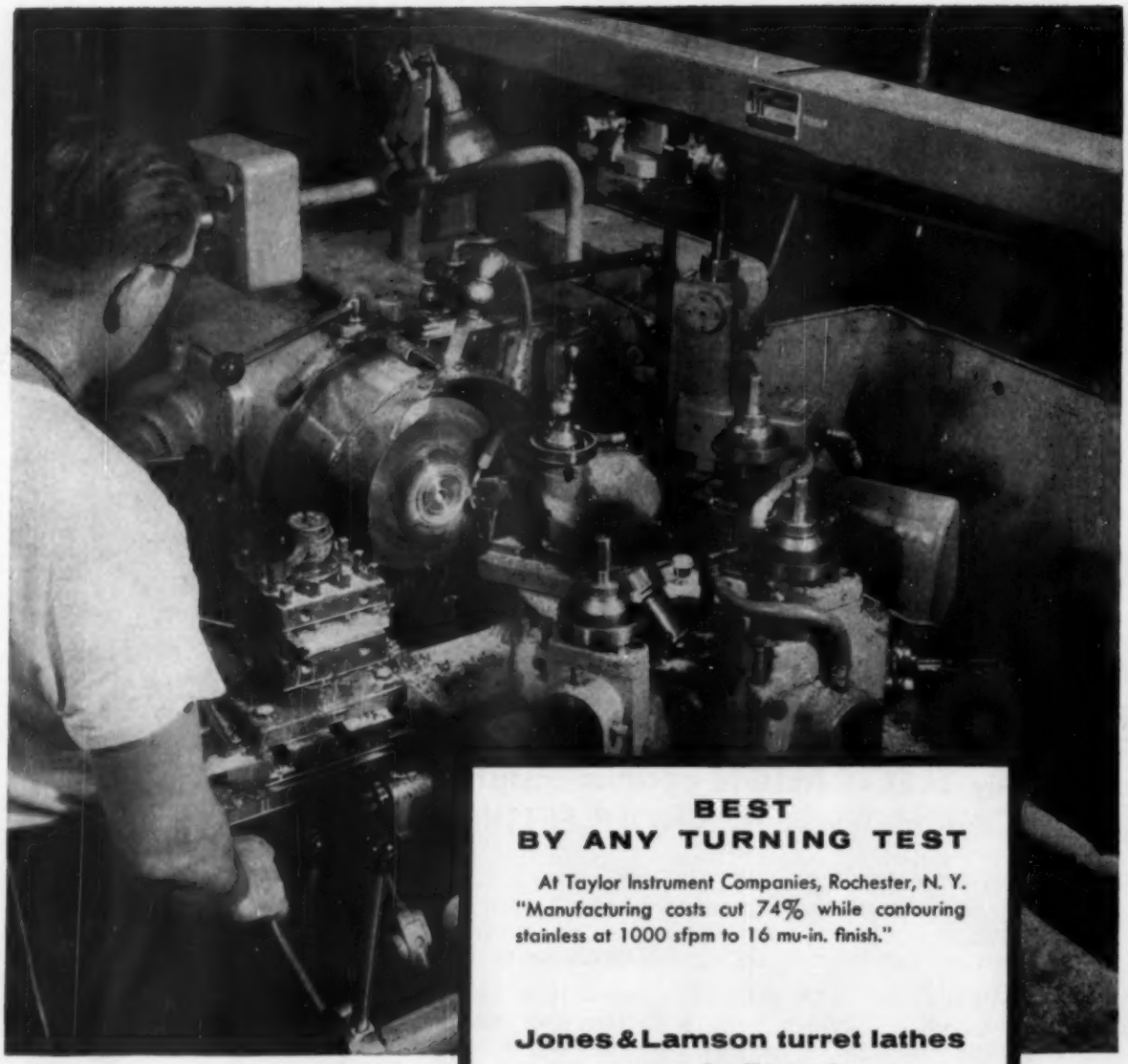
A DEPENDABLE "WATCHDOG" that indicates any change in original alignment requiring readjustment. Alignment can be instantly restored.

AMPLIFIER SERVES DOUBLE DUTY. Can also be used with Electralign Comparator Selector (base) to permit electronic caliper measurements to 0.00001", without removing work from machine. Converts from alignment to gaging simply by turning the Selector switch.

The home of PRECISION CENTER

Brown & Sharpe

MILLING, GRINDING, AND SCREW MACHINES • CUTTERS
MACHINE TOOL ACCESSORIES • PRECISION TOOLS • PUMPS



BEST
BY ANY TURNING TEST

At Taylor Instrument Companies, Rochester, N. Y. "Manufacturing costs cut 74% while contouring stainless at 1000 sfpm to 16 mu-in. finish."

Jones & Lamson turret lathes are built and powered to produce...

MORE CHIPS per tool
MORE PIECES per hour
MORE PROFIT per job

than any other turret lathe of comparable size!

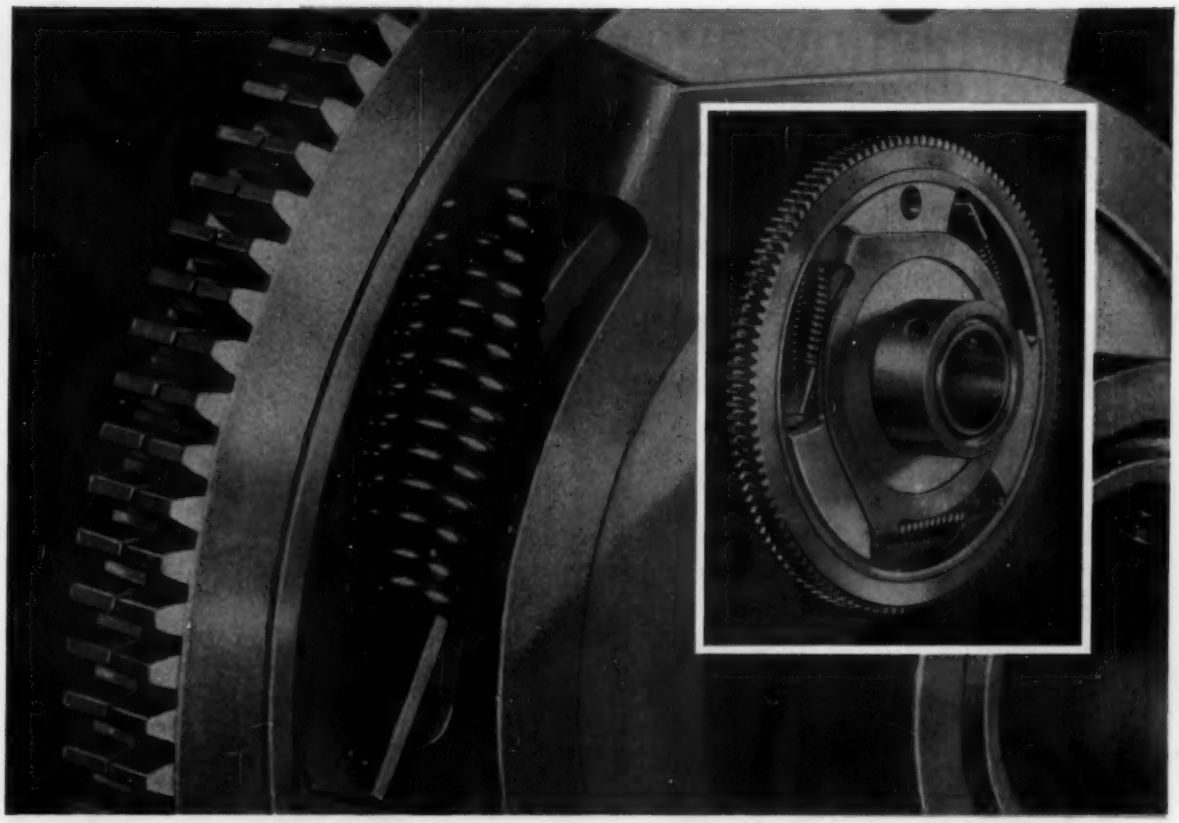
Write Jones & Lamson for details

JONES & LAMSON

the man who needs a new machine tool is already paying for it

JONES & LAMSON MACHINE COMPANY, 502 Clinton St., Springfield, Vt., U.S.A.

J&L MACHINE TOOL DIV.



G.S. gives you NON-SPREAD CONTROL for preloaded Gears with this patented "*SPRING-GRIP*" construction . . .

FRACTIONAL HORSEPOWER GEARING

GEAR Specialties, Inc.

2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

The cross-springing feature of this patented G.S. *"Spring-Grip"* construction holds the twin Gears of this anti-backlash unit under positive control—without spreading or parting—under thrust load from the mating Spur or Worm. Without such control, the scissors action which "pinches" the teeth of the mating part may be interfered with, through improper location of tooth contact with the mating part.

The illustration shows how this *"Spring-Grip"* feature is applied to a Worm Gear; one of the twin elements is fixed to the hub, the other is free to rotate within limits controlled by the springs. G.S. *"Spring-Grip"* construction is also available in straight or helical Spur Gears.

We can also supply other styles of preloaded Gears with compression-type coil springs, torsion or loop springs, to fit varying needs. All are made with the famous G.S. precision and rigid quality control, assuring the accurate tooth profiles so essential in the intimate contact occurring with anti-backlash Gearing.

G.S. specialized experience, broad line, and unsurpassed engineering and manufacturing resources—the most extensive in its field—can help solve *your* Fractional Horsepower Gear problems too. Call us in to discuss them!

SEND FOR *G.S. technical data, free! See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. Folder contains 23 pictures of Small Gears, plant view, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!*

41 Years of Specializing in Small Gearing!

Inland Ledloy*...the original leaded steels

Twenty years ago they said it couldn't be done. But Inland tackled the problem—discovered how to add lead to steel and produced the world's first commercial leaded steel in Inland furnaces. Since then, further research and refinement has been unceasing—each new Inland technical development providing still greater production possibilities for the metalworking industry. Due to constantly improving product quality, Ledloy steels today set the standards by which all other free machining steels are compared.

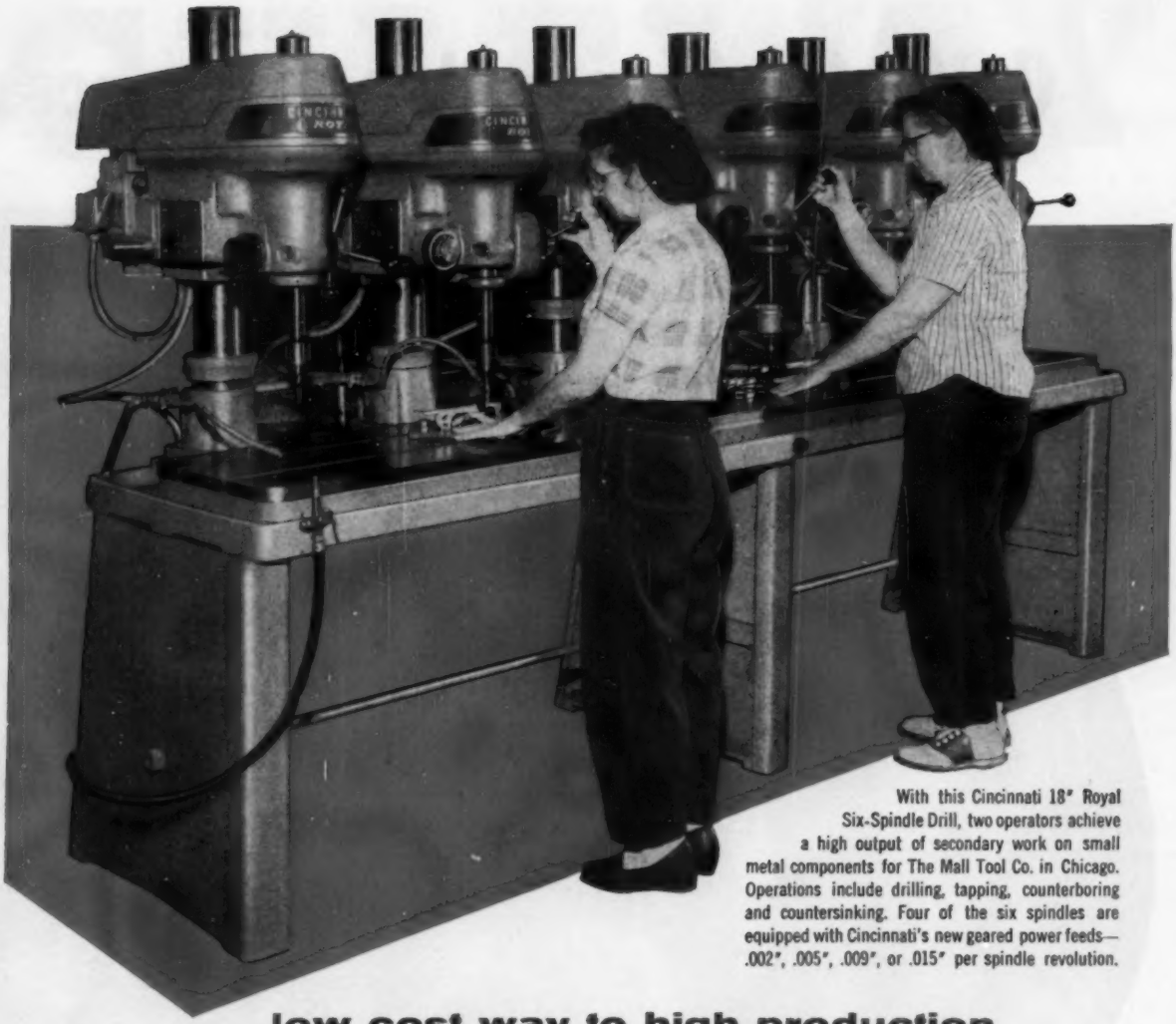
This metallurgist is helping one of Inland's customers get the maximum benefits from Ledloy—the world's most machinable steels. As an expert, backed by Inland's many years of experience with leaded steels, his advice often results in better finishes, closer tolerances, reduced machining time or increased tool life for Ledloy users.

Men like this who had a part in Inland's pioneering and developing of leaded steels, have literally grown up with Ledloy. Through the years they have worked closely with users in hundreds of applications. Experience such as this cannot be matched.

Experience makes Inland Ledloy better

INLAND LEDLOY is sold in cold drawn form, under various trade names, by leading cold drawers and steel warehouses from coast to coast.

***INLAND STEEL COMPANY** 38 South Dearborn Street • Chicago, Illinois Sales Offices: Chicago, Milwaukee, St. Paul, Davenport, St. Louis, Kansas City, Indianapolis, Detroit, New York • *registered trade name of Inland Steel Company, pioneer in the development of leaded steels.*



With this Cincinnati 18" Royal Six-Spindle Drill, two operators achieve a high output of secondary work on small metal components for The Mall Tool Co. in Chicago. Operations include drilling, tapping, counterboring and countersinking. Four of the six spindles are equipped with Cincinnati's new geared power feeds—.002", .005", .009", or .015" per spindle revolution.

low cost way to high production

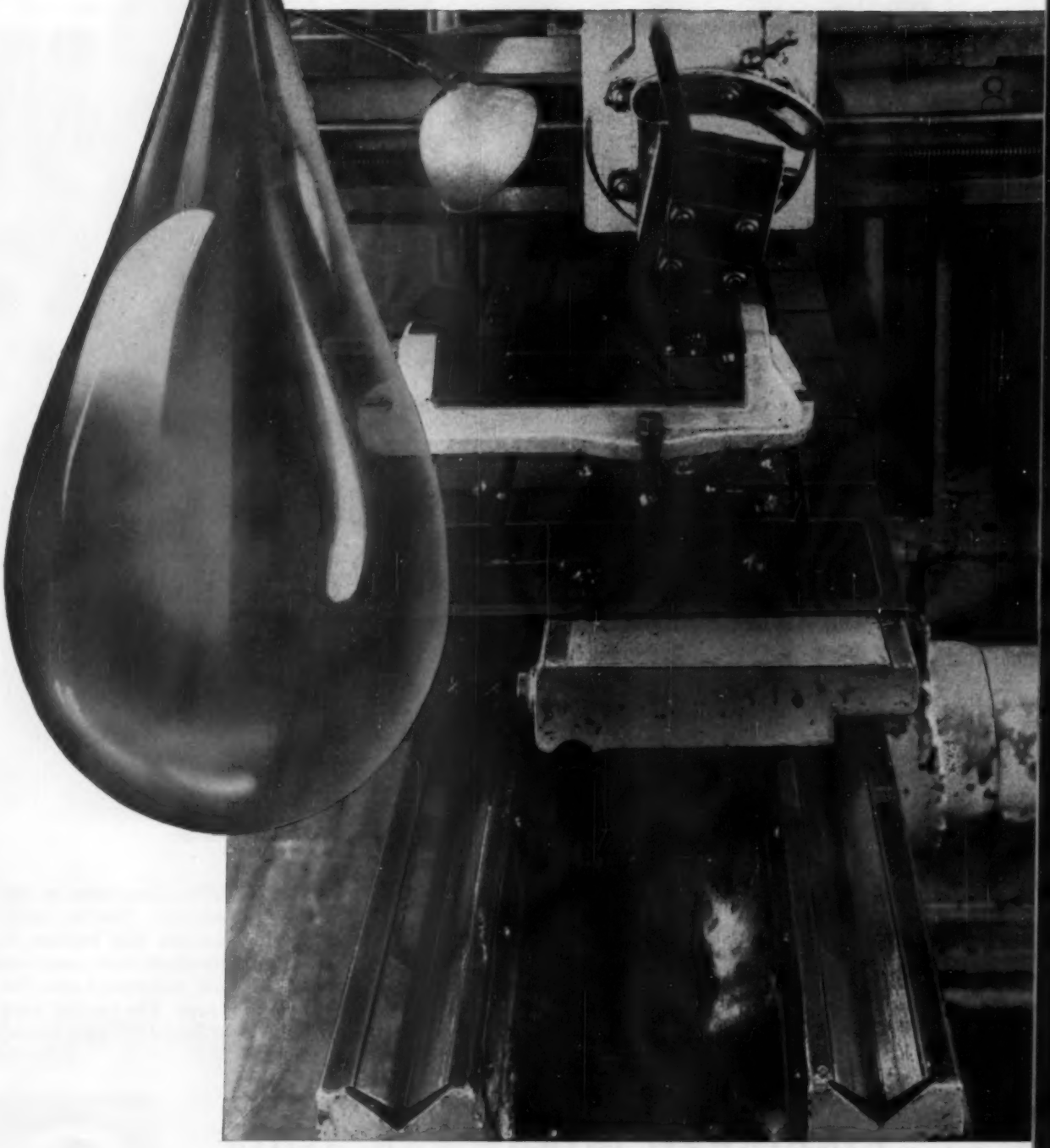
CINCINNATI ROYAL
Multiple-Spindle Drills

Here's how you can make production really *move* on sequence drilling operations—and keep your drilling machine investment *low*. Install new Cincinnati Royal Multiple-Spindle Drills. They have the high accuracy, speed range and work area you need to accomplish a wide variety of precision drilling operations. All-new, Cincinnati-engineered Royal Drills are available in 16" and 18" sizes, 1, 2, 3, 4 or 6 spindles, with drilling capacities in cast iron of $\frac{5}{8}$" and 1" respectively. They're *metal-working* drills, built by machine tool builders to machine tool standards. Investigate their many fine construction features . . . their economical price. See the CL&T dealer in your area. For catalog data, write Cincinnati Lathe and Tool Co., 3207 Disney St., Cincinnati 9, Ohio.

center on **cincinnati lathes and drills**

Builders of Engine, Toolroom, and Fixed Gap Bed Lathes and a Complete Line of Drilling Machines

Gulf Oil Corporation announces



Gulfway meets machine tool manufacturers' specifications as a way lubricant and hydraulic medium for grinders, milling machines, planers and boring machines, lathes and other machine tools.

GULFWAY

new three-purpose oil for smoother operation of machine tools

AS A WAY LUBRICANT

Gulfway forms an exceptionally slippery and tenacious film on slides and ways. Its inherent high oiliness is bolstered by a tackiness agent that keeps it sticking to metal. Gulfway will not squeeze out when the table is at rest for long periods. It contains a special low-shear additive that maintains lubricity when clearances are tight or loads are excessive. Gulfway eliminates "stick-slip" chattering that shortens tool life and causes excessive wear of the ways.

AS A HYDRAULIC FLUID

Gulfway will not plug hydraulic lines and controls and cause pumps to work erratically. It flows freely at all times, even after long periods of dormancy—needs no run-in or warm up and places no strain on pump or motor.

AS A BEARING AND GEAR OIL

Gulfway's characteristic oiliness and high load-bearing capacity make it an ideal lubricant for machine tool gears and bearings. Its long service stability provides an extra margin of economy.

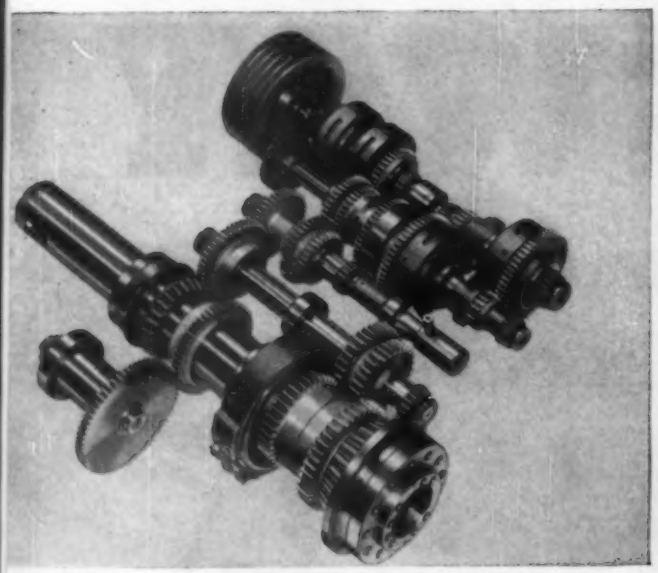
Gulfway is available in two different viscosities. Why not make this new oil prove itself in one or more of *your* machines? Contact your nearest Gulf office, or write to:

GULF

GULF OIL CORPORATION
1822 Gulf Building
Pittsburgh 30, Pennsylvania

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

WANT MORE POWER, MORE SPEEDS?



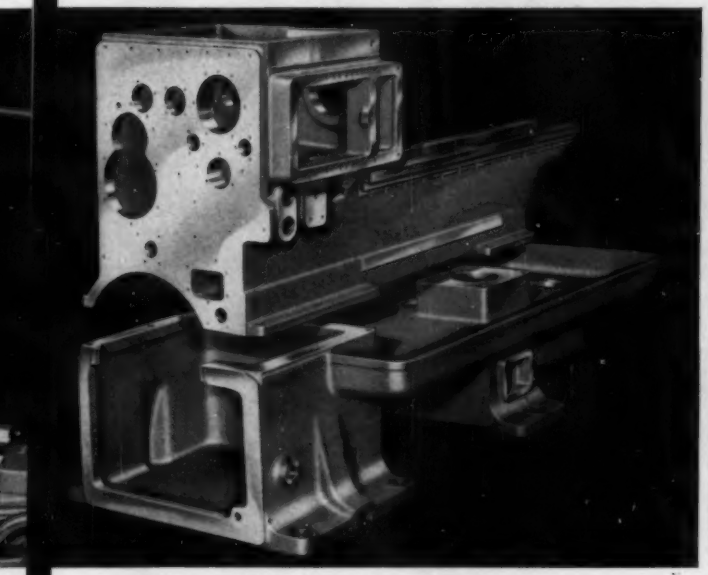
NEW HEADSTOCK GEAR TRAIN—sixteen different spindle speeds available, powered by up to 30 h.p. single-speed driving motor delivering full power at all speeds. Spindle is mounted on selected pre-loaded, precision-tapered roller bearings. Heavier, more rugged design provides smoother, quieter power.

HYDRAULIC SPEED SELECTOR—smooth, effortless speed changes. No waiting, no computing, no stopping of spindle, no releasing of main drive clutch. Operates direct or pre-set. Hi-Lo Lever permits instantaneous speed changes in 8:1 ratio without moving Speed Selector handwheel. Multiple Disc Clutches have automatic take-up for wear.

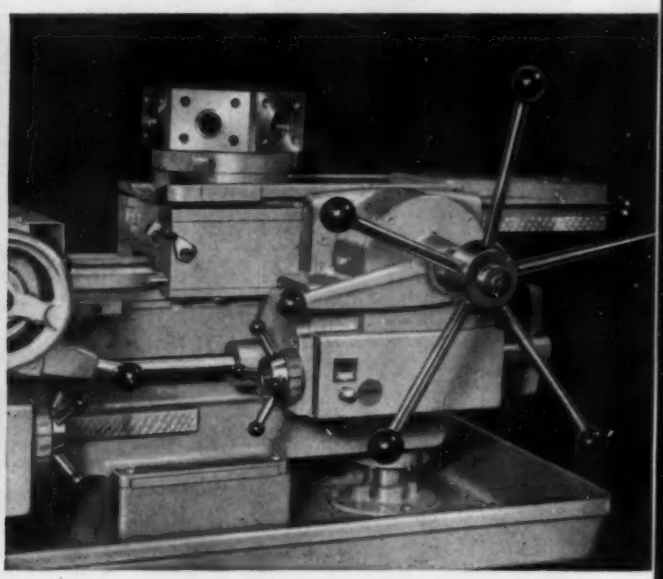
YOU GET THEM ALL...PLUS

NEW GISHOLT MASTERLINE

WANT HEAVY CUTS WITHOUT VIBRATION?



NEW HEADSTOCK AND BED CASTING—scientific design dampens out vibrations, assures smooth operation and simplifies holding closer tolerances. Made from semi-steel, poured in Gisholt's own foundry. Greater swing over ways permits bigger chucks and broader range of workpiece sizes. Provides a solid foundation for all types of work.



NEW TURRET RAM AND SADDLE—designed wider, heavier, more rigid to handle increased capacity and higher speeds. Dial-type feed selector makes feed changes faster, easier. Turret ram rigidly supported on 64-66 Rockwell C alloy steel way strips. Power transmitted through serrated tooth clutches, with shear pin protection against overloading.

GREATER VERSATILITY...WITH THE

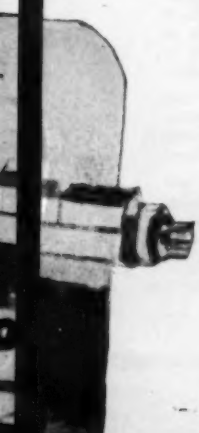
RAM TYPE TURRET LATHE

YOU'LL SPEED UP your production jobs—both large and small—with this more powerful, more versatile Gisholt MASTERLINE Ram Type Turret Lathe.

Here is a machine designed from end-to-end for easier setups, faster change-over and higher productive output than ever before. Check the advanced features illustrated above. Note the reserve power to handle your heaviest cuts—and to meet your tooling requirements of tomorrow. Note the extra spindle speeds—all at your operator's finger tips, without computing—for faster, better turning of any type material. And look over the new massive design, the over-all ruggedness that permits greater accuracy, closer tolerances, deeper cuts at punishing feeds without vibration.

Find out now how this powerful, flexible Gisholt MASTERLINE Ram Type Turret Lathe can reduce floor-to-floor time on your specific jobs. Call your Gisholt Representative today—let him show you how this advanced machine can fit most profitably into your production picture. Or write direct to Gisholt for the new literature described below.

READY NOW—all-new, 18-page illustrated Bulletin No. 1174-B, covering features, accessories, tools and floor plans on new Gisholt MASTERLINE Ram Type Turret Lathes. Ask for it!



GISHOLT MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS

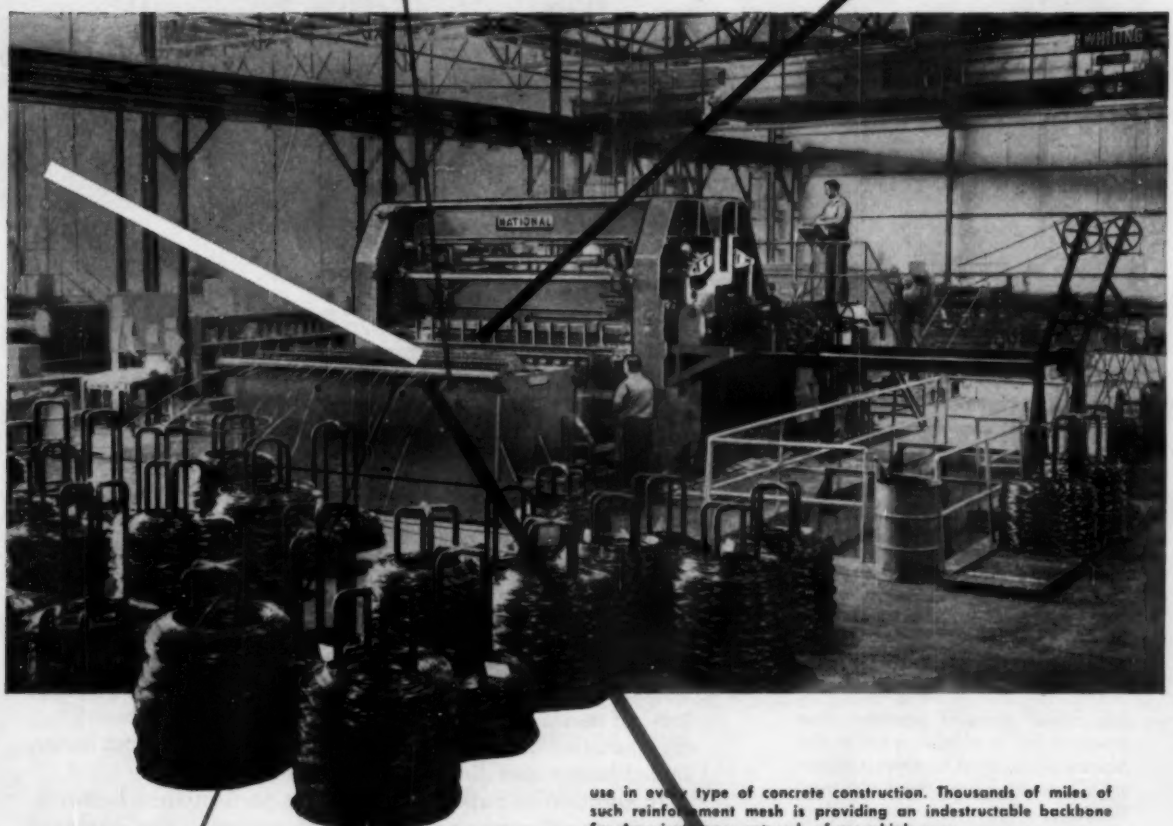
Operators know Card taps are action-mated precision performers — for example, on materials like cast iron, brass, stainless steel, aluminum and magnesium. That's because these top-quality tools are always available with different cutting angles and surface treatments — at standard prices. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

CARD

DIVISION OF UNION TWIST DRILL COMPANY

— Serving you through fine distributors from Coast to Coast

this NATIONAL ELECTRIC UNIT is a completely automatic high speed wire mesh manufacturing plant



Starting with coils of line-wire, this National Electric Wire Fabric Welder automatically turns out welded wire mesh in a variety of sizes . . . and at surprising speeds. In a single hour, as much as 250 miles of wire is transformed into high-quality wire mesh for all kinds of uses including reinforcement in concrete construction, fencing, etc.

Beginning at a line wire straightener unit, each wire is passed over as many as 10 grooved, staggered rollers for straightening.

Next, the line wires pass over welding dies within the machine's welding unit. Here, under a pressure of 60,000 lbs., a mat as wide as 200" is welded at each junction-point, the cross-wires being fed in automatically, at whatever spacing may be indicated by the reciprocating indexing-platen.

The machine next shears rectangular mats to the required size or winds welded fabric into coils of desired length. Finished coils are automatically discharged onto a ramp . . . rolling away to the loading dock or warehouse.

The rugged, steel-mill design and construction of this machine makes it possible to efficiently weld as many as 120 cross-wires per minute. Since 1945, National Electric Wire Fabric Welders have been dependably turning out welded wire mesh in numerous sizes, for use in every type of concrete construction. Thousands of miles of such reinforcement mesh is providing an indestructable backbone for America's new network of superhighways.

Complete automation, the key to profitable production, is made possible in National Electric Welding machines by means of utilizing automatic feeds, radial feeds, automatic positioners, multi-head design, automatic discharge devices, motor-driven rotating fixtures and sequenced ejectors. By their speed and accuracy, National Electric machines achieve amazing savings in time, labor, and cost-per-weld.

Write today for complete information on National Electric Automatic Wire Mesh Welders or any other special or standard welding problem that you may have.

50

NATIONAL ELECTRIC WELDING MACHINES CO.

1860 N. TRUMBULL STREET

BAY CITY, MICHIGAN

25 YEARS EXPERIENCE DESIGNING AND BUILDING: SPECIAL & STANDARD • AIR • HYDRAULIC • MOTOR DRIVEN • SPOT • PROJECTION • SEAM • BUTT • FLASH • RESISTANCE WELDERS • PRODUCTION FIXTURES FOR ALL TYPES OF AUTOMATIC ARC WELDING.

Bay State abrasive engineer Don Kennedy put in enough years in the Navy to learn about rust removal and other grinding jobs the hard way. Whatever your company's grinding problems may be, you'll find Bay State representatives like Don Kennedy ready to help and competent to work out practical solutions.

They're wearing his "hat" wheels* ... and they wear well

When Bay State's now-famous *"hat" wheels** were first introduced at a large East Coast shipyard, they caused quite a sensation. Here were revolutionary new grinding wheels that tore off metal like cup wheels but were much less heavy ... that handled as easily as coated abrasive discs but cut faster, lasted longer and did more work at lower cost.

In addition to outstanding product performance, however, Bay State offers prompt, intelligent service. Sales engineer Don Kennedy not only works with top supervisors; he gets out on the job with the operators and digs into their problems, too.

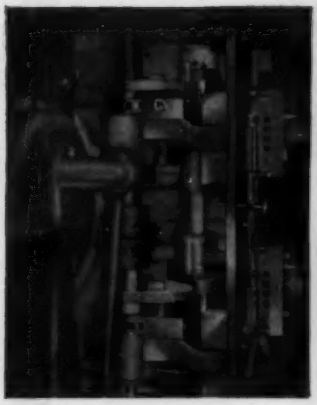
As a result, his recommendations are both practical and specific ... Blue Flash for speed and heavy stock removal ... Bayflex to resist loading on soft metals ... Saf-T-Cut for longer life on hard, jagged surfaces ... DuraCut for blending and finishing broad areas.

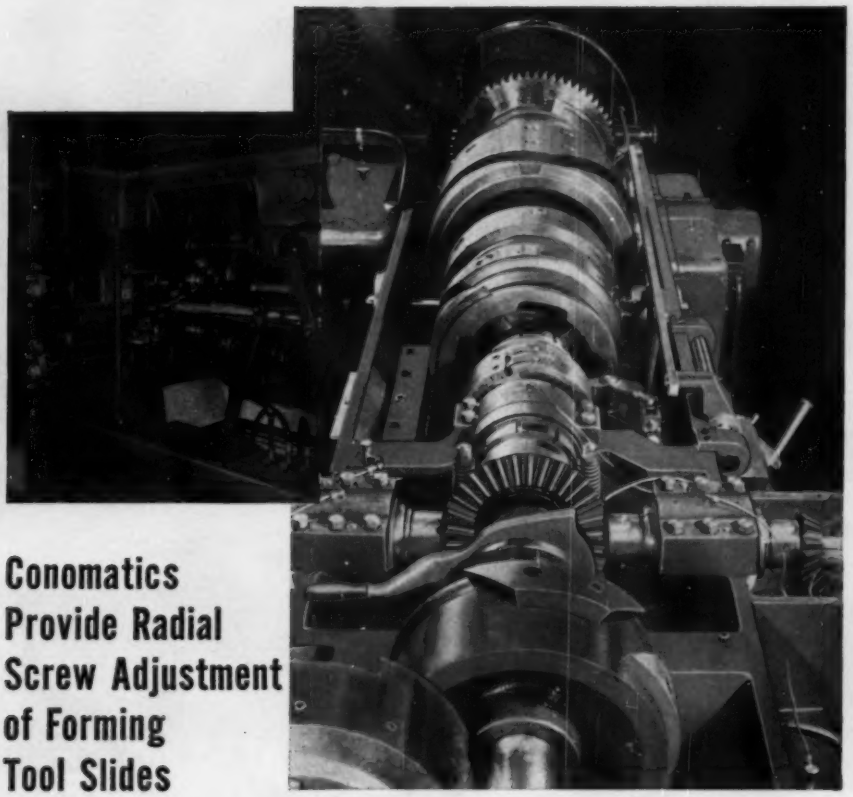
**Raised hub disc wheels, reinforced for extra safety.*

BAY STATE
WHEELS of PROGRESS

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts
Branch Offices and Warehouses: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities. Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario.



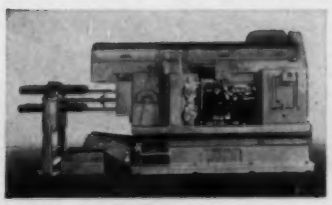


Conomatics Provide Radial Screw Adjustment of Forming Tool Slides

Models 2⅝" LA, 3½" AD, 5" KL, and 5¼" KR Conomatic Four Spindle Bar Machines are equipped with a number of quick job-change features. One of these is the all-position end attachment drive for the mounting of endworking opposed spindles in all positions, with independent feed to as many as three opposed spindles on a single setup.

Another feature that is of considerable importance in tooling up is the radial screw adjustment of all sideworking slides. Trial cuts may be taken to correct diameters with form tools without changing the clamped positions of the form tool holders.

All Conomatic quick changeover models are equipped with dial adjustment of the working stroke of all tool carrying slides. Besides the Four Spindle machines there are three quick change Six Spindle models in 9/16", 1" and 1⅝" sizes.
Write, wire, or phone for literature.



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U S.A.

OUT FOR 22 MINUTES—

Seeing a "Technical Metal Working Film you'll never forget"

You are invited to view, in your own plant at a time of your own choosing, a sound moving picture that well may cause you to reconsider the whole approach to your metal turning processes. And we predict that you will wish to have it re-run, perhaps several times, for selected management, production and engineering personnel.

For the new Monarch film "When The Chips Are Down" is *not* a sales or a product demonstration film. It is a factual study of the progress of our Machinability and Development Laboratories. It is a report of their scientific attack on such turning problems as feed, speed, and tooling expressed in the obtaining of data on cutting tool forces, tool geometry, work distortion, and vibration; on chemical and metallurgical properties of metal; on shear properties; on cutting fluids. And it shows the practical applications of such research in improved design of lathes and lathe components. Also it makes possible a service to our customers whereby we help them achieve optimum cutting conditions, top quality and accuracy, highest production returns.

If you will just write us (Dept. A) on your business letterhead, we will gladly make arrangements for a viewing—without the slightest obligation. You might well find it the most rewarding twenty-two minutes of a busy day.

Special instrumentation applied to Monarch Machinability Test Lathe.

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES
FOR A GOOD TURN FASTER ... TURN TO MONARCH

THE MONARCH MACHINE TOOL COMPANY
SIDNEY, OHIO

CLEVELANDS

automatically set the pace for progress!

Whitin Machine Works, Whitinsville, Mass., builders of textile preparatory machinery and other products, in part of a $4½ million expansion program, has created one of the outstanding screw machine departments in the East. *Sixteen new Cleveland Single Spindle Automatics* (14, Model AB 3″ Dialmatics and 2, Cleveland 4¼″ Model AW's) are among the facilities that are automatically setting the pace for progress at Whitin Machine Works.

William Steele, Divisional Superintendent, and Eino Johnson, Department Foreman, describe this ultra-modern installation as "one that few companies anywhere can equal. Our machine tool investment includes highly versatile Cleveland Automatics, many with electronic controls, that make possible higher production with still closer tolerances . . in many instances to 0.0005″. As has been wisely said, 'you cannot build today's products with yesterday's machines, and still be in business tomorrow'."

Let Clevelands automatically set the pace for progress in your plant. Call in a Cleveland Automatic sales engineer.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

HARDINGE
ELMIRA, N.Y.

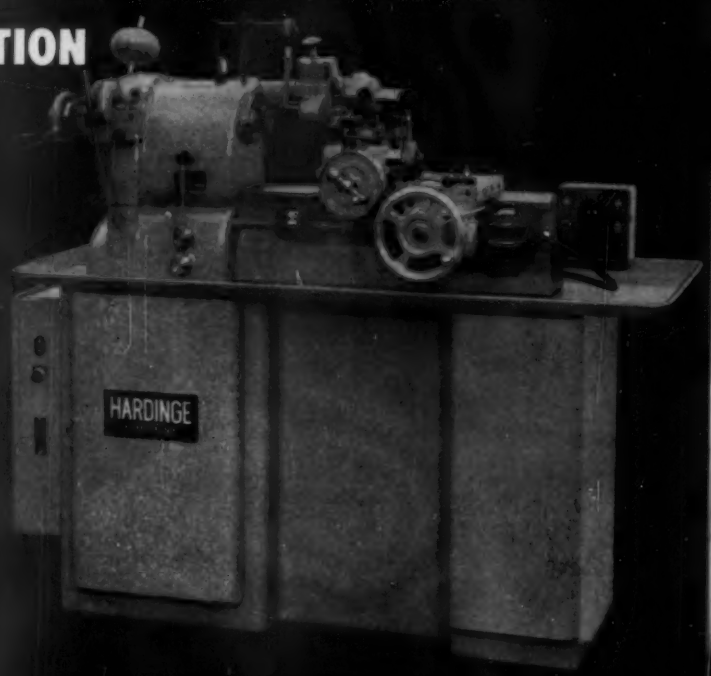
HARDINGE EASY READING BLACK and WHITE DIALS

mean INCREASED PRODUCTION

. . . **HARDINGE** developed these fast setting easy reading **black and white dials** – they assure maximum accuracy with high production.

Pioneered with the Hardinge High Speed Precision Chucking Machine model HCT shown here – **Hardinge black and white dials** are now standard equipment at **no extra cost** on all of our tool room and production machines.

Invest in Hardinge equipment for product improvement and increased production. Ask for bulletin on our tool room and production machines.

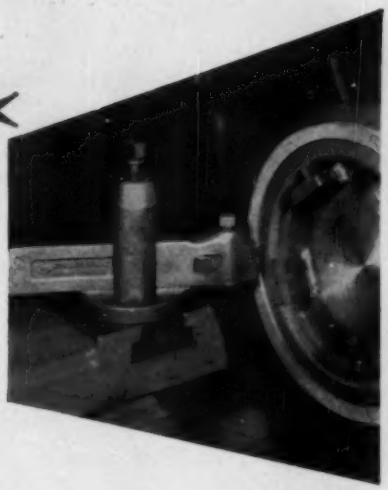


HARDINGE BROTHERS, INC.
ELMIRA, N. Y.

PROVED BY INDEPENDENT LABORATORY TESTS:

62% S·M·I*

for FERROCARBO®-TREATED IRON



Progressive foundrymen seeking to improve the machinability and quality of gray iron and malleable iron castings can now rely upon FERROCARBO—the patented additive in briquette form—by CARBORUNDUM. Tests by a widely-known independent research organization, have proved conclusively that the addition of FERROCARBO® to the cupola charge results in finer-grained, denser, and stronger castings with a machinability improvement factor as high as 62% over untreated iron. The better *dispersal action* of FERROCARBO and the resulting *better machinability* of the iron, are your assurance of a *better satisfied* customer.

* Surface Machinability Improvement

HOW TESTS WERE CONDUCTED

Tool-wear tests were conducted on metal cast in leading foundries across the country, using untreated iron and Ferrocarbo-treated iron of identical or similar chemistry. Both were machined at commercial speeds using a single point "Carboloy," grade 44A tool. Tool life was determined by measuring wear on the flank of the tool with a 100-power microscope. The charts at the right show actual test data as reported.

➡ **WRITE FOR MORE INFORMATION** on how FERROCARBO produces more machinable iron regardless of metal composition. Ask for booklet—Form A-1409—Electro Minerals Division, The Carborundum Company, Niagara Falls, New York.

Chemical Analyses	Untreated	Ferrocarbo® Treated
C	3.57	3.56
Si	2.25	2.26
S	.10	.10
Mn	.68	.66
P	.11	.11
Cutting speed (ft./min.)	300	300
Feed (in./rev.)	.009	.009
Depth of Cut (in.)	.062	.062
Wear land (in.)	.015	.015
Vol. of metal removed (cu. in.)	53	86
Weight of metal removed (lbs.)	13.7	22.2
Per Cent improvement		62%

ELECTRO MINERALS DIVISION

The CARBORUNDUM Company

REGISTERED TRADE MARK

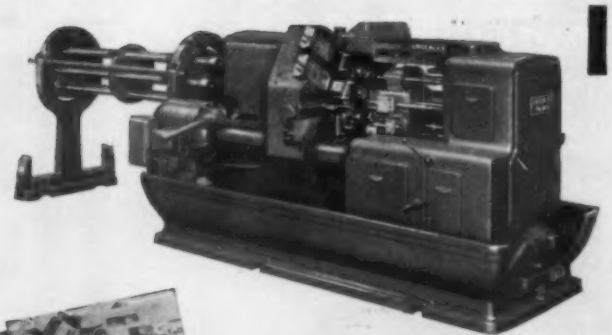
FERROCARBO DISTRIBUTORS—KERCHNER, MARSHALL & CO., PITTSBURGH • Cleveland • Buffalo • Philadelphia • Birmingham • Los Angeles • Canada
MILLER & COMPANY, CHICAGO • St. Louis • Cincinnati

84-73

1. Simplified cross-slide camming
2. Interchangeable cross-slide tool holders
3. Quick-adjusting stroke mechanism
4. Rapid speed and feed changes
5. Wide-open, easily reached tooling area
6. Built-in threading feed and drive
7. Easily accessible main toolslide holders
8. Stationary type collets changed quickly

eight big reasons why you get *Fast Setups* on GREENLEE BAR AUTOMATICS

In plant after plant countless hours of setup time are saved each year on Greenlee Bar Automatics. Similar savings in time and money can be achieved in your own plant. Greenlee has on-the-job case studies to prove it. Whether your responsibility lies in the field of management . . . production . . engineering . . . or purchasing you owe it to yourself and your company to call in the Greenlee man. Let him show you why and how faster setups on a Greenlee pay off in greater profits.



PRODUCTION MACHINERY
GREENLEE

4-SPINDLE...6-SPINDLE
SECOND-OPERATION
PNEUMATIC STOCK FEED

WRITE TODAY FOR CATALOG A-405

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1731 Mason Avenue
Rockford, Illinois

How to Relax

If you're all tied up in knots over the high cost of operations, there's an easy way for you to break the tension. Put CIMCOOL° to work in your plant and dreams of increased production and lower costs will become realities. You'll relax with the knowledge that CIMCOOL Concentrate is taking care of your cutting fluid problems. Here's why:

- **CIMCOOL LOWERS COSTS** because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.
- **CIMCOOL DOES A BETTER JOB** because of its chemical lubricity. It permits faster speeds and feeds, for it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants.
- **CIMCOOL IS CLEAN,** doesn't soil clothing or hands. It contains no skin irritants. It leaves no slippery film on shoes, floors, machines or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

There's no need to send up smoke signals. Simply phone your CIMCOOL Distributor. He'll give you complete information on CIMCOOL Concentrate—and the entire family of CIMCOOL Cutting Fluids.

Or contact us direct. We'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

CIMCOOL **Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Concentrates** — For jobs requiring oil-base cutting fluids. Added to mineral oils, they give economical mixes for higher speeds and feeds.

CIMCOOL **Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.

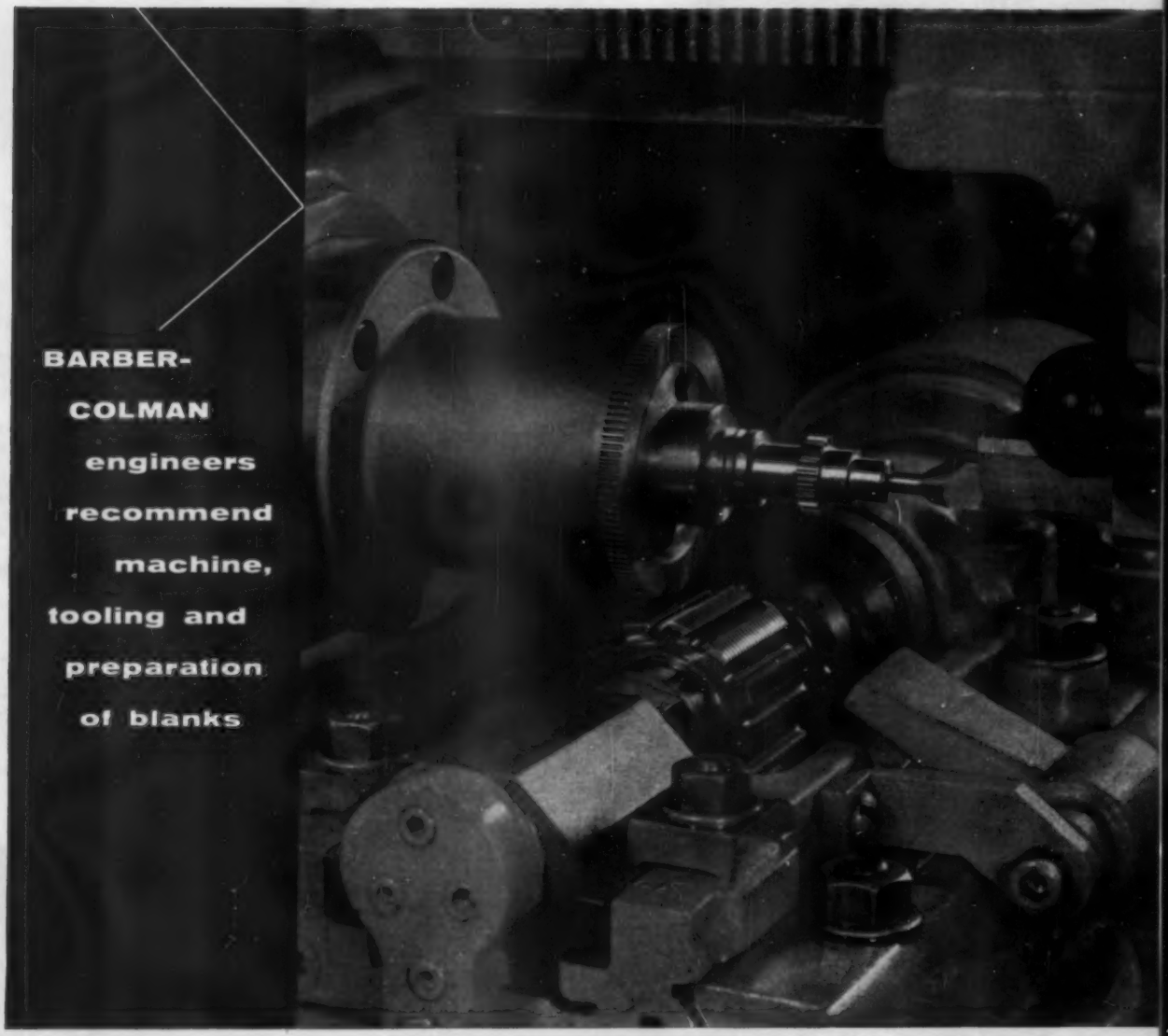
CIMCOOL **Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

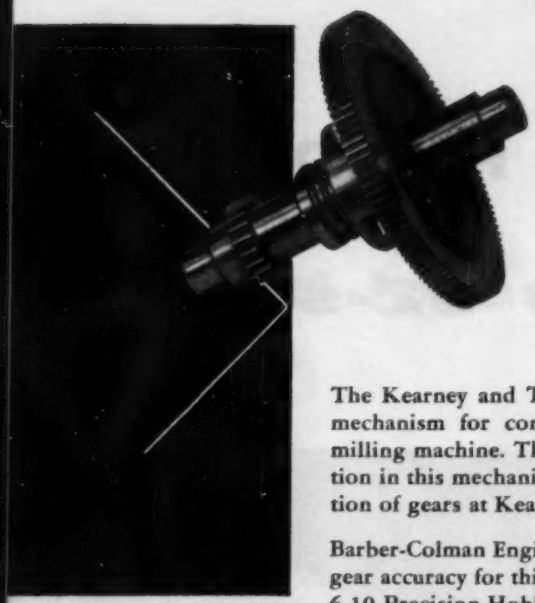
CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

GUARANTEED ACCURACY
with standard-type precision
hobbing machines





The Kearney and Trecker Corporation have designed a servo-control mechanism for controlling an airframe section profile and contour milling machine. The extreme accuracy required for the transfer of motion in this mechanism demanded a whole new approach to the production of gears at Kearney and Trecker.

Barber-Colman Engineers were consulted for their suggestions to assure gear accuracy for this program. They recommended a standard-type No. 6-10 Precision Hobbing Machine and designed special tooling for each of the eight gears in the mechanism. They also specified the preparation of the blanks for hobbing.

This machine is guaranteed to cut a 4″ diameter spur gear within .0002″ adjacent and .0004″ non-adjacent spacing error checked on an optical dividing head. The blanks are ground on the diameter and sides, holding the diameter, parallelism and radial and axial runout within .0001″. Two holes are provided for driving the gear during hobbing.

These photographs show one of the gears in the train and the special tooling designed for it. The blanks are located between centers and are driven by a diamond-shaped pin in the backing plate. For hobbing this 48 D.P., 115 tooth gear, a feed of .010″ is used, and the hob speed is 183 R.P.M. The material is stress-proof steel R.C. 27. Barber-Colman Class AA taper-bore hobs are used and resharpened to original hob accuracy on a Barber-Colman No. 6-5 Hob Sharpening Machine.

With this equipment and recommended procedure, all gears in the train are hobbed well within Precision Class 2 AGMA tolerances. The success of this program is indicated by the results obtained on the example shown. Inspection shows these gears are consistently within .0002″ tooth-to-tooth and .0004″ total composite error.

Accuracy of this degree is not unusual with Barber-Colman machines and hobs. This case shows the results which can be obtained by working closely with, and following the recommendations of, experienced hobbing technicians. When you have applications requiring accurate gears, consult Barber-Colman hobbing experts for their recommendations.

BARBER-COLMAN COMPANY

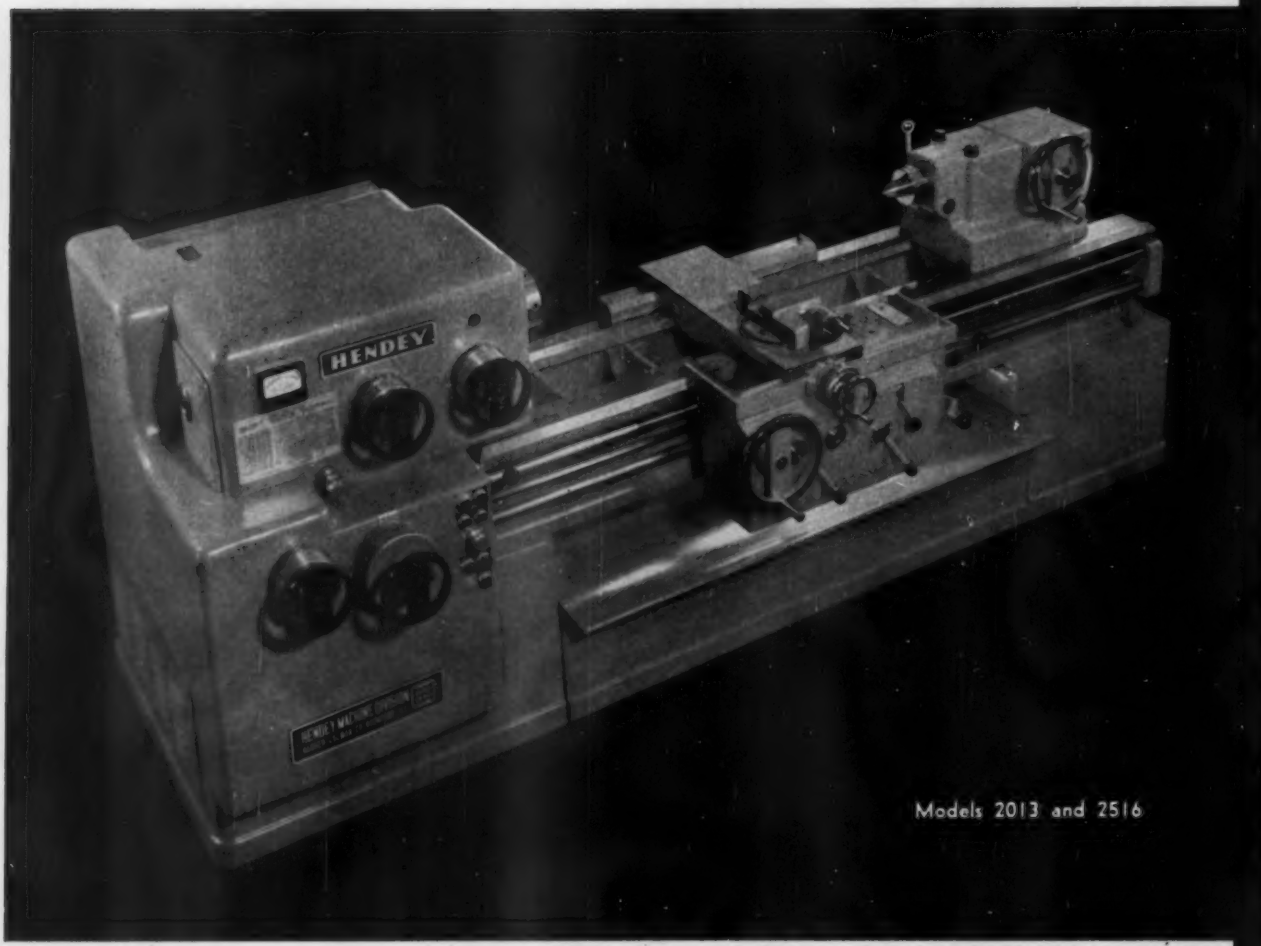
6111 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

NOW! FROM HENDEY...

all new 32-speed



Models 2013 and 2516

More rigidity, more threading features, more lathe per dollar!

geared-head lathe

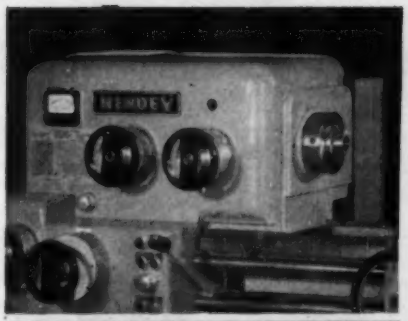
Here are the all-new Hendey No. 2013 and No. 2516 lathes, with a 32-speed geared head (up to 2000 rpm), a complete line-up of threading features, and heavy-duty design combined with toolroom precision. The 32-speed headstock transmission contains crowned, flame-hardened spur gears which are automatically lubricated. You select speeds simply by shifting gears. Greatly simplified mechanical design gives you lower maintenance costs — more machine, dollar for dollar, than any other lathe in its class.

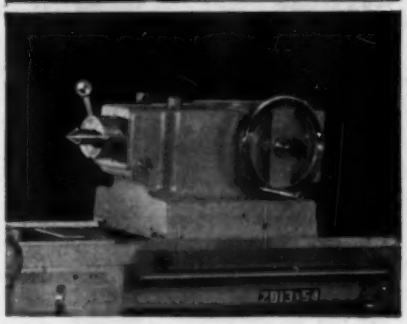
Three sets of super-precision tapered roller bearings support the spindle at both ends and in the middle, increasing accuracy and improving finish. An automatic spindle adjuster eliminates any manual adjustment of the spindle bearings regardless of the spindle speed.

The extra-heavy bed casting is made of dense, wear-resistant semi-steel, which is induction-hardened and ground on all way surfaces. Lathes can be furnished with a 15, 20, or 25 hp spindle drive motor and come equipped with a load meter and automatic overload release for the carriage feed.

Hendey has all the threading features, including: (1) multiple-thread indexing spindle, (2) built-in thread-chasing dial, (3) 66 feed and thread changes, with 2 to 120 quick-change threads per inch and feed range from .0015 in. to .091 in. per revolution, (4) reverse lever on apron, (5) automatic micrometer stops, (6) ball-thread-chasing stop on cross-feed screw, (7) hardened and precision-ground cross-feed screw and compound screw, (8) automatic, filtered lubrication to the half nuts.

Compare these tailstock features with other lathes on the market: Weighing almost 400 lb, the tailstock can be positioned quickly and easily with one hand. And the ways under it are hardened and ground. Large 4½ in. diameter spindle has a full 10 in. extension, with slow and rapid traverse speeds.





Hendey machine division
BARBER-COLMAN COMPANY
111 Loomis St., Rockford, Illinois

BARBER COLMAN ®

Special Size Reamers
ARE STANDARD WITH L&I

TWO MORE L&I EXCLUSIVES ...AT NO EXTRA COST!

DOWEL PIN REAMERS
Straight Shank, Right Hand Cut with Straight, Right or Left Hand Spiral Flutes.
14 Sizes from .1230 thru .4995" Sets, tool

OVER & UNDER SIZE CHUCKING REAMERS
Straight Shank, Right Hand Cut with Straight, Right or Left Hand Spiral Flutes.
14 Sizes from .124 thru .501" Sets, tool

These reamers are two more reasons why L&I is the source for a complete reamer line.
See your L&I Distributor.

L&I

"the reamer specialists"
LAVALLEE & IDE, INC.
CHICOPEE, MASS.

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Oil-free Bearings

Dear Sirs:
We have just read the item, "Oil-free Bearings," in "Talking Shop" (*AM*—July 29 '57, p129) and noted that you appear not to be aware of the bushings and thrust washers, as also flat strip material, which we manufacture. We have much pleasure, therefore, in informing you that we carry a stock range of bearings incorporating this plastic.

As you may know, PTFE has an extremely low coefficient of friction, but in the mass it has low mechanical strength and low thermal conductivity which severely limits its uses as a bearing material to sustain appreciable loads or speeds. We have, however, developed a method in which the plastic is supported by a porous matrix bonded to a steel backing, and this composite material has the excellent anti-frictional properties of the PTFE combined with the mechanical strength and thermal conductivity of the metallic backing.

Our products are made from such material, consisting of a mild steel backing to which is sintered a layer of porous bronze about 0.010 in. thick, subsequently impregnated with PTFE. As produced, these components are prefinished and must not be machined on their bearing surfaces.

In addition, we also supply strip material, identical to that from which the bushings are made, in lengths of 18 in. and widths of 4 in. and in the following nominal thicknesses: 0.044, 0.059, 0.075, and 0.091 in.

It may also interest you to hear that we have several customers in the US in the aeronautical and in the food machinery field who are taking production quantities of our bushings. Should you wish to have any further details of these products, we shall be most happy to advise you.

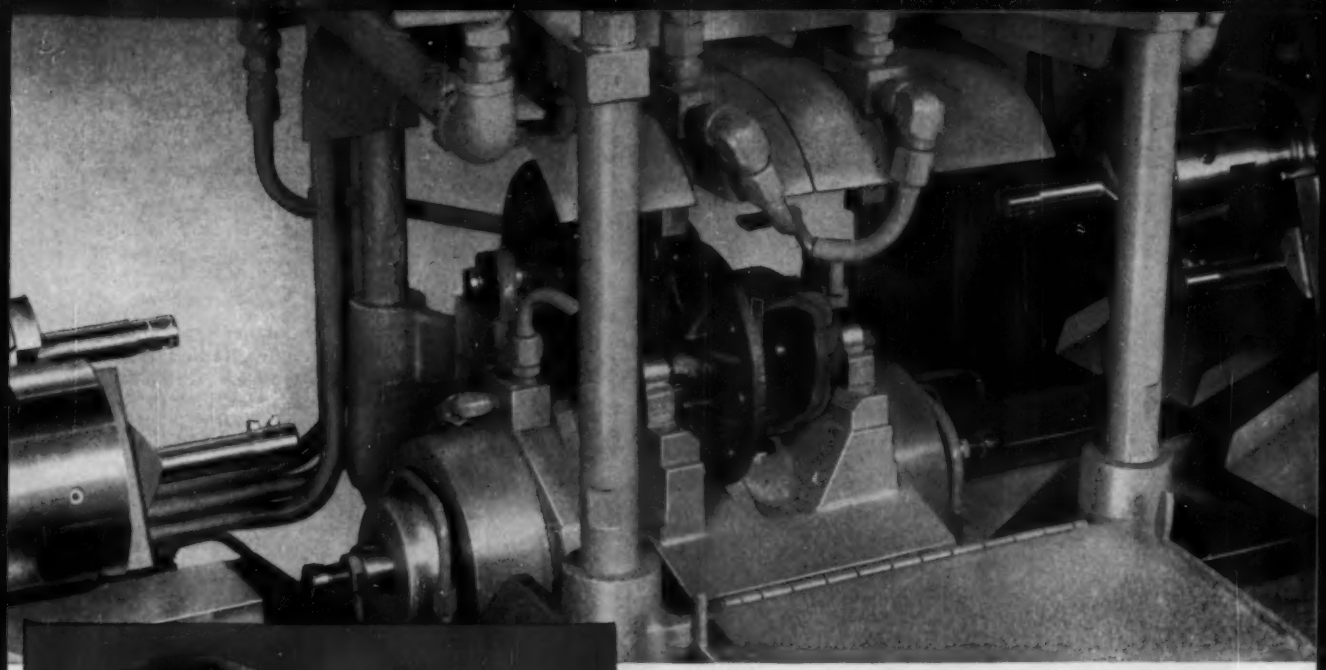
I H Onslow
The Glacier Metal Co, Ltd
Wembley, England

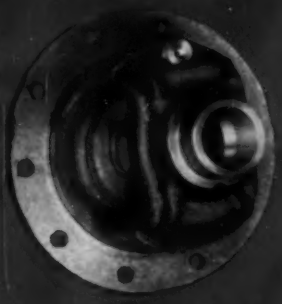
The original item in "Talking Shop" told of the experiments being performed at the Bureau of Standards in which a combination of PTFE and PTFCE is being applied to high-altitude instrument bearings.

SHOPMATES

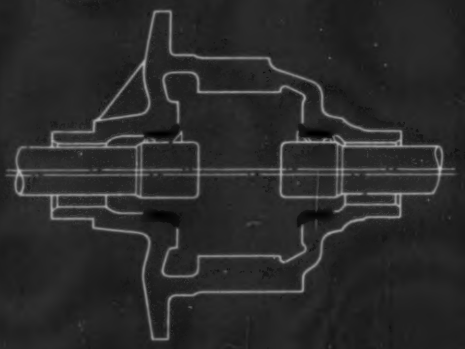
N. Jarvis

I CAN'T MAKE HEADS OR TAILS OF THIS WIRING ... THERE'S NO TWO MACHINES AROUND HERE THAT'S WIRED THE SAME!! BOY!! WHAT A MESS!!
HEADS OR TAILS SHOULD BE EASY— THE GUY THAT WIRED 'EM UP THE FIRST TIME WAS FLIPPIN' A COIN TO TELL WHICH WIRES WENT WHERE!
THEY ARE TOO WIRED THE SAME — ALL OF 'EM ARE OFF WHEN THE SWITCH SAYS ON— —EXCEPT THE ONE THAT SAYS TILT!!
N. Jarvis





Above, close-up of parts in fixture. Overhead air clamps in position for loading and unloading. Part shown at left.



Internal boring and chamfering cuts indicated by black lines. Tolerances are held to ± .0005".

Ex-Cell-O Two-Way Precision Boring Machine ups production, increases accuracy.

XLO EX-CELL-O FOR PRECISION

Increases Production, Keeps Accuracy

Back-bores and Chamfers Differential Cases

If you want to increase production, yet maintain .0005" accuracy, get an Ex-Cell-O Two-Way Precision Boring Machine. That's the opinion of an automobile manufacturer.

Right now this machine is performing back-boring and chamfering operations inside steel automotive differential cases for this company. Boring bars enter the case on the center line of the bores, then move 5/32" off center, perform the cutting operations, then withdraw after returning to the center line. Two cases are machined at the same time.

Ex-Cell-O Way Machines perform as one, two, three, and four-way assemblies with exceptional versatility.

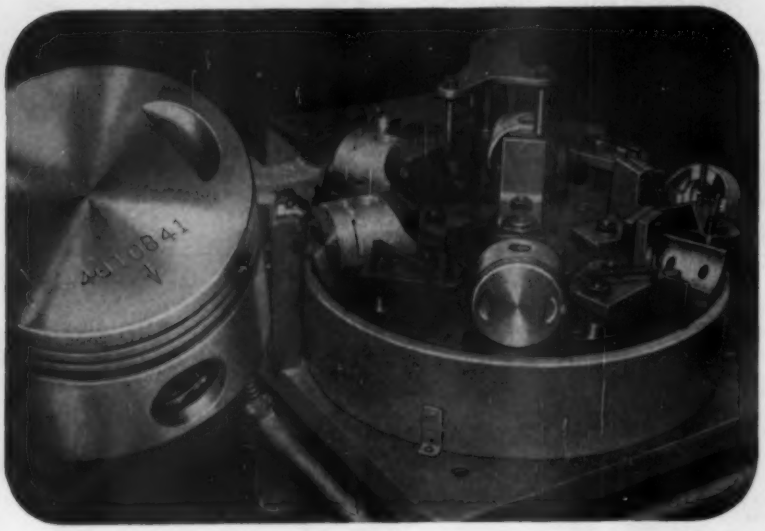
These machines adapt smoothly into automated lines, too. See your Ex-Cell-O representative or write Ex-Cell-O, Detroit.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

57-24

LEADERS IN INDUSTRY MARK WITH NOBLEWEST



LEADING *AUTOMOTIVE* MANUFACTURERS
Save Time and Money with Noblewest

HIGH SPEED PRODUCTION MARKING MACHINES

Model 342 (illustrated above) is another fine example of Noblewest's unique ability to provide industry with high speed marking equipment for part numbering, trade marking, or date coding . . . with *permanently indented* impressions that last as long as the product itself. This model was especially designed for marking and ejecting approximately 2500 pistons per hour with absolute uniformity of impression. Basic model (right) can be tooled for marking many sizes and shapes of component parts in metal, plastic, hard rubber and wood. Whatever your needs for marking, Noblewest makes the machines, tools and dies to do the job *faster, better at lower cost.* Write for comprehensive new catalog. The Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

Noblewest is equally famed for fine markind dies . . . made to the most exacting standards of quality . . . yet, they are competitively priced.

MARK IT BEST WITH
NOBLEWEST Roll-O-Matic MARKING
EQUIPMENT FOR MARKING - GRADUATING - EMBOSSING - NUMBERING

We are pleased to learn that a similar bearing material is available commercially—Ed.

Chipless Cutoff

Dear Sirs:
I would like further information on the machine technique described in "Chipless Cutoff for Pipes and Tubes" by Buckley Sullivan and Richard Minser (*AM*—July 15 '57, p158).

Can you tell me the name of a concern where these cutters and rollers can be purchased?

Paul X Callahan
Louisville, Ky

Dear Sirs:
. . . Can you tell us whether these cutters are standard and who sells them?

O P Held
Yonkers, NY

For further information and for sources of supply for this equipment, we can suggest the following two manufacturers: Bardons & Oliver Co, 1133 West 9th, Cleveland, Ohio; and Wallace Supplies Manufacturing Co, 1300 Diversey Parkway, Chicago, Ill—Ed.

Standard Controls

Dear Sirs:
Cheers for M V Hayes and his efforts to introduce some uniformity into automatic machines before they branch off in so many directions that standardization be-

Helpful Henry

by L. Hoppes

"This young fellow forgot his lunch. I told him we'd share ours with him!"

comes impossible (*AM*—Sept 23 '57, p105).

That's what happened in regular machine tools, and in spite of all that has been said about "building blocks," the concept makes very slow headway against the every-man-for-himself situation.

Maybe that problem can be avoided on automatic machines, at least to the extent of having them respond to uniform input signals. Let's hope the control builders can agree on some workable standards.

Name withheld

CALENDAR

AMERICAN STANDARDS ASSOCIATION —National Conference, Nov 13-15, St Francis Hotel, San Francisco, Calif.

INVESTMENT CASTING INSTITUTE—Annual Meeting, Nov 19-20, Sheraton Hotel, Chicago, Ill.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — Annual Meeting, Dec 1-6, Statler Hotel, New York, NY.

SOCIETY OF AUTOMOTIVE ENGINEERS —Annual Meeting and Display, Jan 13-17, Sheraton-Cadillac and Statler Hotels, Detroit, Mich.

NATIONAL TOOL & DIE MANUFACTURERS ASSOCIATION — Winter Meeting, Feb 5-8, Ambassador Hotel, Los Angeles, Calif.

AMERICAN MACHINE TOOL DISTRIBUTORS ASSOCIATION — Spring Meeting, Mar 10-11, Hotel Roosevelt, New Orleans, La.

SOCIETY OF THE PLASTICS INDUSTRY —Annual National Conference and Exposition, Mar 18-21, Los Angeles Biltmore Hotel and Shrine Exposition Hall, Los Angeles, Calif.

SOCIETY OF AUTOMOTIVE ENGINEERS —Production Meeting and Forum, Mar 31-Apr 2, The Drake, Chicago, Ill.

SOCIETY OF AUTOMOTIVE ENGINEERS —Aeronautic Meeting and Display, Apr 8-11, Hotel Commodore, New York, NY.

AMERICAN WELDING SOCIETY — Spring Meeting and Welding Show, Apr 14-18, Statler Hotel, St Louis, Mo.

AMERICAN SOCIETY OF TOOL ENGINEERS—Tool Show, May 1-8 (closed Sunday), Convention Center, Philadelphia, Pa.

AMERICAN SOCIETY FOR METALS—Southwestern Metal Exposition and Congress, May 12-16, State Fair Park, Dallas, Texas.

REED RTD

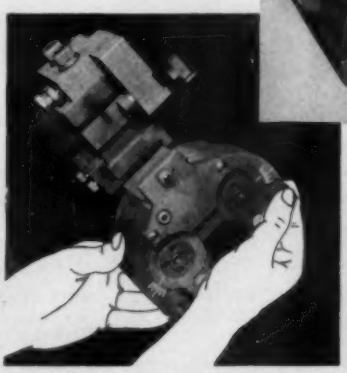
Series B—Geared Type

Thread Rolling Attachments

give you the fastest method for producing uniform precision threads on automatic screw machines

The Reed Thread Rolling Attachment is a multi-purpose precision tool of wide range for rolling machine screw threads, straight and taper pipe threads, including Dryseal (NPTF), annular rings, oil grooves, knurling and other cold-forming operations. Eliminates secondary operations by rolling behind shoulders. Change may be made from straight to taper threading by changing rolls only. No additional equipment is necessary.

Self-Compensating Roll Action
simplifies setup, provides longer roll life and reduces down time to a minimum. Excess strain and side pressures during rolling are overcome by built-in compensators which function automatically to assure proper operation.



Dovetail Clamping Arrangement
permits attachment head to be removed from adapter which remains in permanent location on screw machine. Head is then reassembled in original operating position. This important feature is exclusive with Reed Attachments.

Rolls for Common Straight Thread and Taper Pipe Thread In Stock—FOR IMMEDIATE DELIVERY

REED SERVICE PERSONNEL AVAILABLE to assist with initial installation. Application and Operating Instruction Book supplied with each attachment. Complete satisfaction assured.

Write for Attachment Bulletin B-1

REED ROLLED THREAD DIE CO. TRA 161

Specialists in Thread and Form Rolling Tools and Equipment

WORCESTER 1, MASSACHUSETTS, U. S. A

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif, Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

Announcing THE TOTALLY-NEW LINE OF "BUFFALO" NO. 15 DRILLING MACHINES TAPPERS AND ACCESSORIES

The All-New "Buffalo" No. 15 Drill is packed full of major improvements and superior features . . . all designed to help you speed up production and cut costs.

The completely new design of the No. 15 drilling head achieves an all-time high in operational ease, with these many important advances:

Front-Mounted "Start-Stop" Push Button Switch

Easy-to-Read Speed Range Table

Depth Gauge Graduated for Easy Setting

Conveniently-Placed 3-Grip Spindle Feed

Belt Guard Quickly Tilts Upward to Simplify Speed Changes

Motor Bracket Is Hinged, Permitting Step-to-Step Belt-Changing on the Pulleys Without the Use of Tools

Proper Belt Tension Is Automatically Maintained

No Tools Needed for Adjustments of Head or Table

The newly-designed No. 15 bench and floor bases eliminate grease- and dirt-catching troughs and pockets around the working area. Extremely sensitive for small hole drilling, these new machines are sufficiently rigid and heavy to operate at full capacity without strain or wear.

The new No. 15 line includes bench, floor and pedestal models (bench and pedestal types in 1- to 6-spindle models). Attachments are available for tapping, mortising, routing or spot-facing.

For a demonstration of the amazing new No. 15 Drill, contact your nearby "Buffalo" machine tool dealer. Or, for complete details, write us direct for Bulletin 4024.

All "Buffalo" products feature the famous "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long-life.

ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

BUFFALO FORGE COMPANY

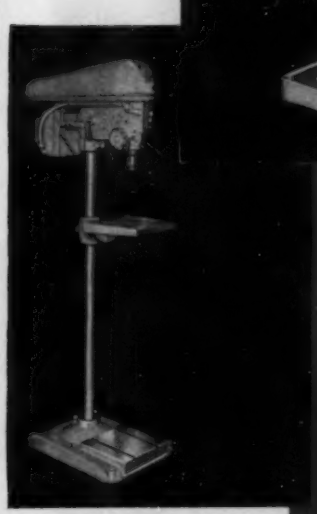
509 Broadway, Buffalo, N. Y.

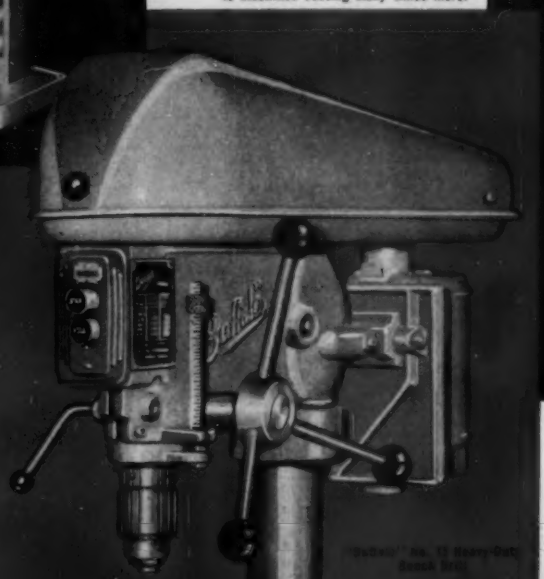
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING BENDING

No. 15 Pedestal Type Drill. This sturdy, efficient machine is built for years of dependable service. Recommended for shops requiring higher production and versatility. Available in 1 to 6 spindles. Overall height 75".

No. 15 Tapping Machine. Available in two sizes: No. 0, 3/16" and No. 1, 5/16" capacity. Stripper and tap oiler are provided. Under favorable conditions this unit will give results equal to machines costing many times more.

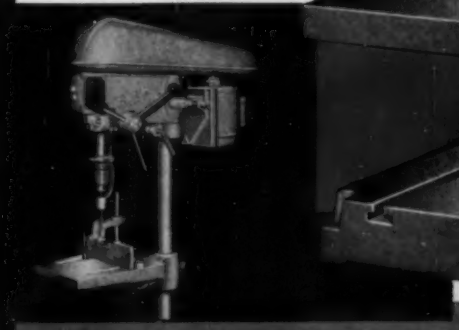


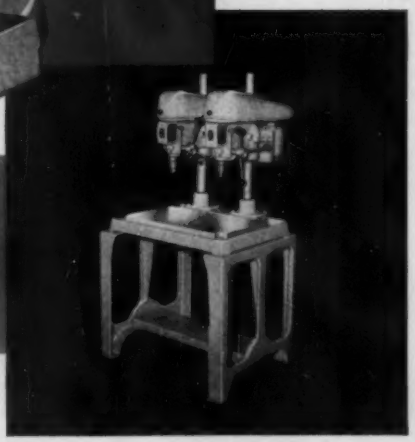


No. 15 Heavy-Duty Floor Drill. Where versatility is a key factor, this model is ideal for a variety of uses in the average machine shop. Over-all height: 68½". 10 x 11" tilting table swivels on 2¾" diam. column. Base is 10 x 10".

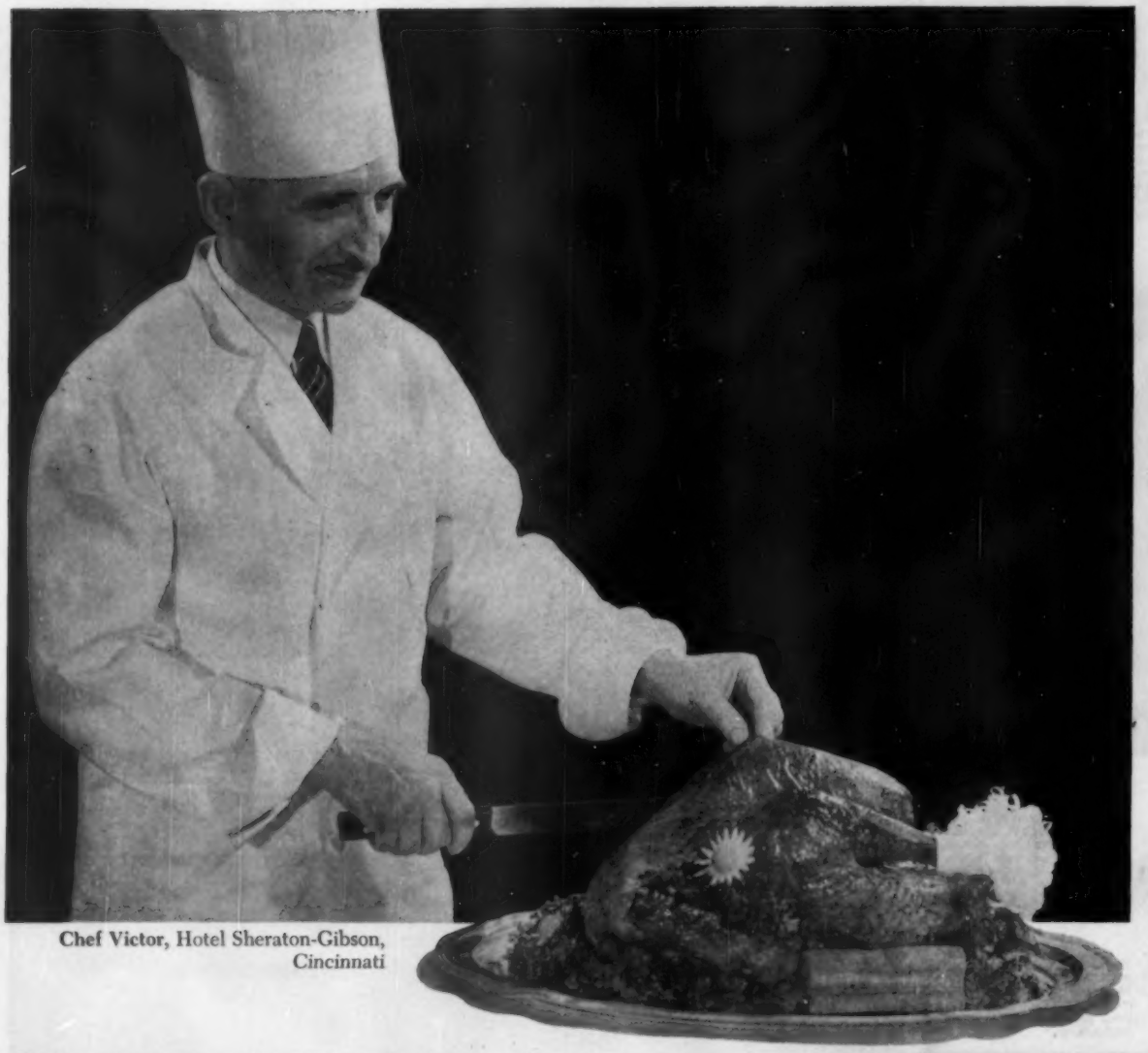
Slow Speed Attachment for No. 15 Drills. Three lower speeds of 112, 210 and 380 RPM are obtained with 60 cycle, 1750 RPM motor. Proportionate speeds with 25 or 50 cycle motors, or those with different shaft speeds.

No. 15 Drill with Mortising Attachment. Attachment fits over chuck. The fence and hold-down are all-metal construction, similar to those on higher priced mortising machines.



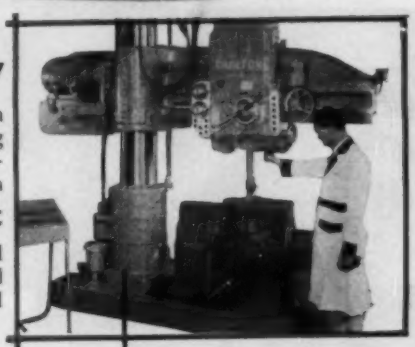


No. 15 Multiple Spindle Bench Drill. Available in 2 to 6 spindles, with or without head-raising device. Working surface of table varies from 14 x 14" for 2-spindle to 14 x 74½" for 6-spindle models.



Chef Victor, Hotel Sheraton-Gibson, Cincinnati

Specialists do the job better:
Every chef has his specialty



It's true when Chef Victor of Cincinnati's famed Hotel Sheraton-Gibson carves a bird; it's true when Carlton makes a radial drill. Because Carlton makes nothing else, Carlton can make radial drills better. Fact is, having concentrated exclusively on radial drill research, engineering and manufacturing since 1916, Carlton can offer a wider range of the most up-to-date radial drills ever developed. Name your need – arm lengths from 3-ft. to 12-ft.; column diameters from 9" to 26" – Carlton makes 'em better. Take your choice of Carlton speed-feed controls – programming, pre-select, partial pre-select or manual – and special bases, tables and jigs for additional productivity. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

Carlton

SPECIALISTS IN RADIAL DRILLS

This Month's

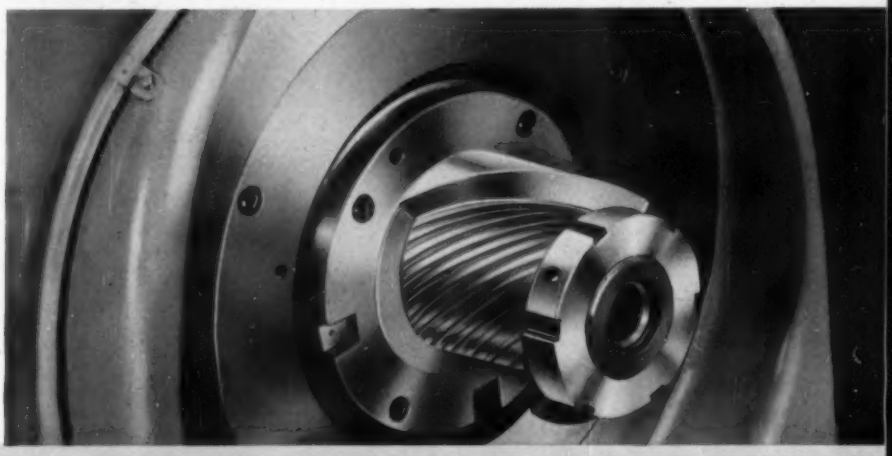
GEAR PIX

UP YOUR GEAR OUTPUT RATE WITH THESE NEW HIGH-SPEED HOBBERS

You can't beat these new horizontal single-spindle gear hobbers for versatility, speed, productivity and capacity. Michigan's latest — Model 1458-B—has a cutting cycle measured in seconds. It is completely automatic. Designed for either conventional or climb hobbing. Center distance—hob arbor to work spindle —is 8 inches. Hobs up to 4-pitch spur or helical gears. Maximum crossfeed stroke of hob is 5 inches. Write for descriptive literature.

NEW GUIDE GIVES CLOSE LEAD CONTROL

An inboard-mounted guide assembly on the 1458-B controls the helix angle being cut (R or L up to 35°) by introducing lead to the work spindle, thus eliminating change gears for controlling lead. Other features: standard conventional approach; optional "plunge-feed" approach, available where suitable for shortest time cycles. Of exceptional rigidity, Michigan's new hobber is of "unitized" construction — all assemblies being mounted on a common surface.



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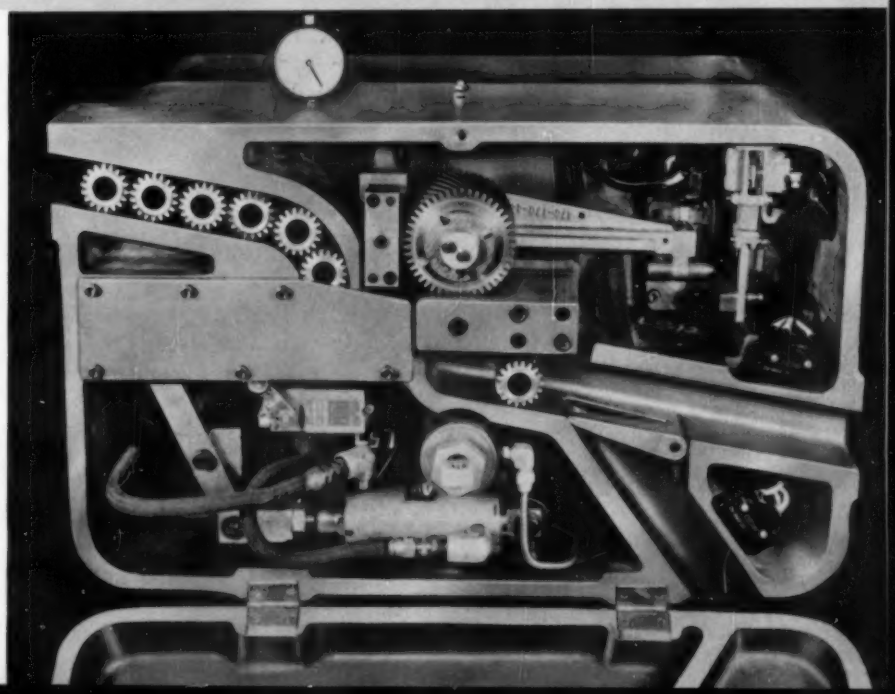
Now available—a unit that 100% inspects spur or helical gears for concentricity in a checking time of only 6 seconds! The checker automatically monitors and classifies. Tolerances are completely variable. Parts are rotated against a master gear in two directions, checked, and passed—rejects are shunted from process. Engineered in sizes to suit large or small gears. Send for details on Michigan's complete line of gear analysis equipment.



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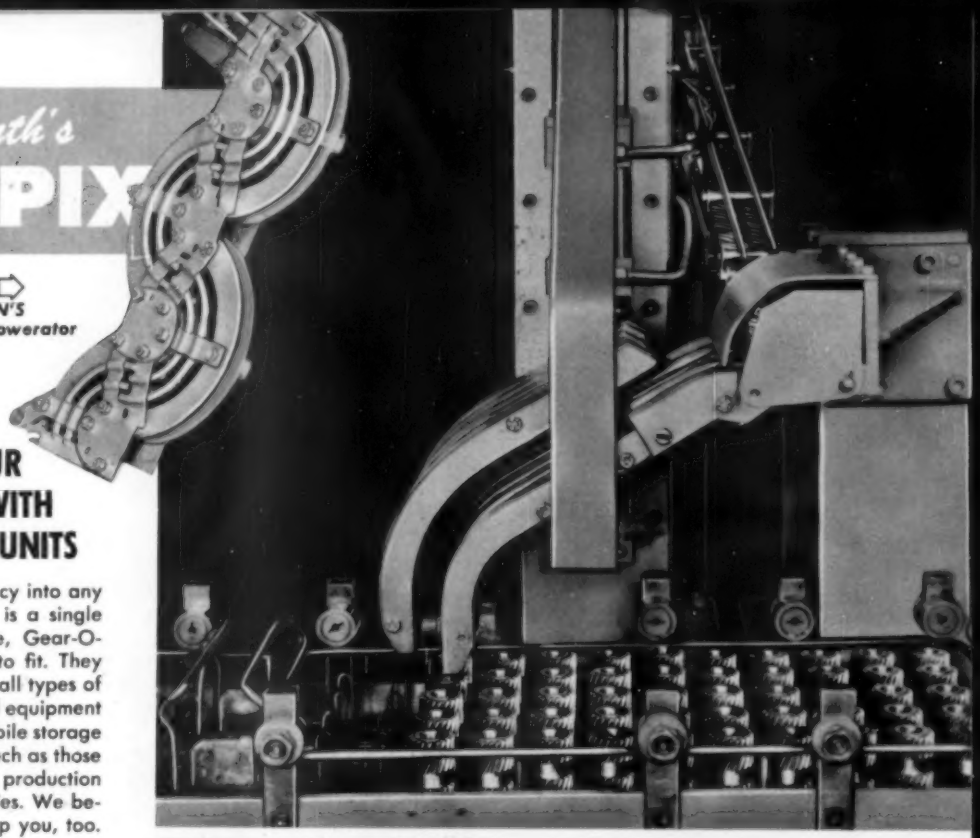
This Month's

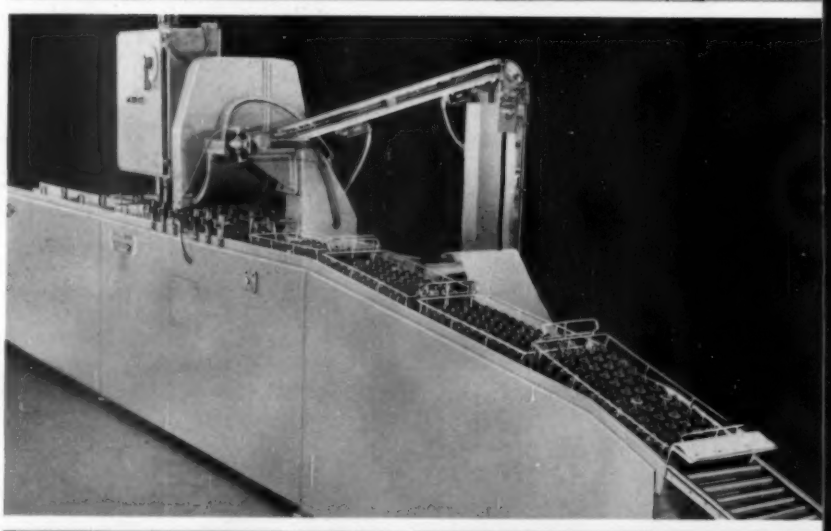
GEAR PIX



GEAR-O-MATION'S
"Velvet-Drop" Parts Lowerator

SIMPLIFY YOUR AUTOMATION WITH GEAR-O-MATION UNITS

Now you can put top efficiency into any automatic setup. Whether it is a single machine or a complete line, Gear-O-Mation has functional units to fit. They not only handle and transfer all types of parts but also serve as control equipment for directional movement, mobile storage and demand feeding. Units such as those shown here are controlling production cost patterns in many industries. We believe Gear-O-Mation can help you, too. Write for full details.



BASKET LOAD YOUR PARTS FASTER

Basket loading need not be a processing bottleneck. Gear-O-Mation's basket loader does it automatically. Assembled from standard components to suit your parts. Middle photo shows loading of center-bored pinions at 3000 per hour. In upper right photo you can see how parts drop onto upright basket prongs a full row at a time. Send for bulletin GO-568.

HIGH-CAPACITY PARTS BANK STORES AND FEEDS

A new Gear-O-Mation storage unit (at right) is for parts that can roll. Parts are gently propelled up a slightly inclined, continuous track as they lean against a slowly revolving, continuous belt. Unit provides true demand feed from active storage. Typical capacity is 2500 blanks 2 inches OD. In continuous operation you can feed 5000 parts an hour. Write for additional information.

GEAR-O-MATION
DIVISION OF MICHIGAN TOOL COMPANY
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Spot news...

- **About $1 billion** will be spent for new production equipment by the metalworking industries between September, 1957, and December, 1958, a special *American Machinist* survey discloses. This estimate is based on returns from 852 companies that themselves expect to buy $105 million of machine tools and presses, and $25 million of other production equipment. For details see pp 170-173.

- **Imports of foreign machine tools, which have been going up sharply**, should be regulated by resorting to same means of control (not increased tariffs) used by other free-world countries, Swan E Bergstrom, chairman, government relations committee, suggested to members of National Machine Tool Builders' Association at their annual meeting. For details on the import situation, see pp 105 and 174.

- **Measurement to within 0.000001 in.** for flats, rounds, tapers, lengths, gear geometry, threads, etc, is being done by Watervliet Arsenal's Final Inspection Dept. Used as a cross-check by National Bureau of Standards and by government inspectors, Watervliet's facilities are also available gratis to defense contracting industries for help in solving gaging problems and for certifying gages.

- **Douglas Aircraft is moving heavy loads by floating them on an air cushion.** The Glide-Aire system employs cargo pallets, which are moved across floors or other supporting surfaces on a cushion of pressurized air as the pallets actuate individual valves in the air system. Alternatively, the air can be released downward from the pallets to keep them floating.

- **Here's an idea of the economies being instituted by aircraft makers** because of cutbacks: Boeing is cutting number of its phones 10 to 25%, cutting permissible long-distance calls 25 to 50%, reducing transportation schedules between the main Seattle plant and branches by 50%.

- **Big decrease in overseas orders** has reduced backlogs of West German industrial machinery builders to five months, with incoming business currently described as "stagnation on a high level." Sales are being affected by credit restrictions at home and currency difficulties abroad. Nevertheless, production was up in first half of 1957.

- **Standardization of dimensions for automation, and of punch tapes** for control of machine tools are being proposed. The dimensional standard provides a basic module of 0.025 in. Proposed punch tape is an all-purpose, 1-in.-wide tape that can take as many as eight levels or channels.

- **Proposal that the U S aircraft industry go into partnership with Germany's** has been advanced by a German aviation consultant. His contention: U S aircraft people could take advantage of Germany's "revolutionary concepts of aeronautical design and construction," for a lot less money than is needed to do such research and development on their own.

- **Union jobless benefits are no bar to payment of state unemployment benefits,** California has ruled, reversing an earlier decision. Test case involved a laid-off Chrysler worker, who while he performed no services during his layoff period, would under terms of his benefit plan have had to take work with another firm if it were offered to him. But none was.

Spot index to major News stories...

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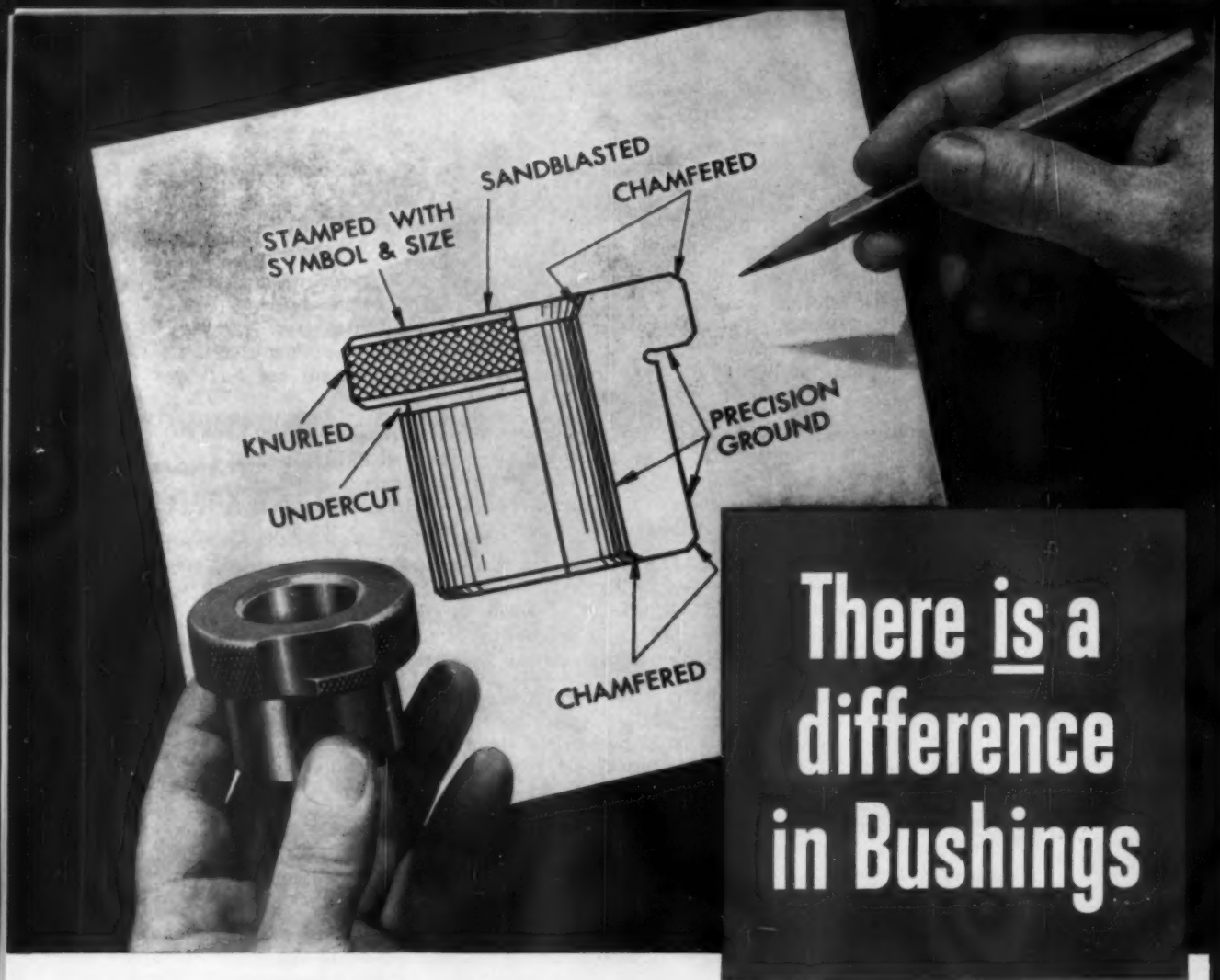

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And here's what it means to you . . .

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There's a difference, too, in accuracy and uniformity of hardness—brought about by automatic control of furnace temperature, time in the furnace, and quenching technique.

These differences make Ex-Cell-O the leader: (1) High chrome, high carbon oil-hardening bearing steel is used for long wear. (2) This steel is uniformly heat treated to 62-64 Rockwell "C". (3) Bushings are precision ground on inside and outside diameters, and under the head for perfect seating. (4) Besides measuring up to A. S. A. standards, bushings must meet Ex-Cell-O's own standards for precision.

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57-91

Washington ... NEWS REPORT

New rules on costs . . .

New rules are being proposed by the Pentagon defining allowable costs in defense contracts—that is, the expenses for which the contractor can legitimately charge the government, and not have to pay out of his own money.

The new rules, when adopted, will cover both cost-plus-fixed-fee and fixed price contracts. Up to now, existing rules on the subject were only "guides" on fixed price contracts, which procurement officers could honor or ignore as they see fit. In addition, these rules will apply in arranging termination settlements for cancelled contracts under advertised bids.

Some industry representatives say the new regulations will tighten up on what's an allowable cost. But Defense officials say that in some cases they'll permit more liberal treatment. One thing is certain: the new regulations are more specific. They'll cover such costs as patent royalties, pension plans, professional services, advertising, bonus plans, depreciation, and the like. They must be used by procurement officers in all services.

Steel prices . . .

. . . obviously aren't going to show any change as a result of the Kefauver Anti-Monopoly Committee's grilling of U S Steel and Bethlehem executives. The Congressional committees have tried to "jawbone" on prices before, and the results are fairly conclusive: nothing happens.

Basically, the steel executives say they actually raised prices less than they should have to cover costs of the wage increase they had to pay last summer. In effect, they absorbed costs that should have been put into prices and paid by steel users.

Eisenhower at the time was arguing strongly for anti-inflation statesmanship on the part of producers of basic materials, particularly.

Another round . . .

. . . of hearings on price increases seems likely next year when a new round of wage negotiations opens. The biggest factor: Walter Reuther and his Auto Workers, who are back in pitching for something big. Last time Reuther made the headlines was three years ago, when he put over the guaranteed annual wage.

Reuther is scheduled to appear before Kefauver's Committee sometime soon; there, he'll propagandize them on how the auto companies can pay higher wages without raising auto prices.

Executive salaries . . .

. . . paid by Bethlehem to its officer directors got the big treatment from Kefauver when Bethlehem President Arthur B Homer appeared to answer questions on steel pricing. Kefauver said that Bethlehem's "Inside Board" of directors (all directors are officers of the company) is drawing down excessive salaries and bonuses—that 11 of the 18 highest paid U S corporation executives last year were Bethlehem officials.

Homer insisted on explaining Bethlehem's incentive compensation plans and linked the "Inside Board" with the company's efficiency.

New bargaining . . .

. . . support for industrial unions is being created inside the AFL-CIO. That's the purpose of Walter Reuther's Industrial Union Department. It is being shifted from a "clearing house" organization for its 71 industrial union members, to a negotiating aid—offering experts on strategy, techniques and even strike funds from its $3 million kitty.

Plans call for expanding the IUD staff to supply whatever negotiating help is wanted by the IUD's affiliates. Too, member unions will extend their present policies of trading information on the same industries or employers where they bargain. Two years of closer association within the IUD now has the unions trading bargaining secrets. The just-approved program gets the jump on 1958 negotiations.

Fear of recession . . .

. . . is still bothering Eisenhower and his top officials about as much as the furore generated by the Soviet Sputnik. White House advisors don't have any real worry for the next couple of months—but they're getting less and less optimistic about the first half of next year.

The stock market, the Middle East war scare, Sputnik, Khrushchev's threats—**all these are** wearing away at the administration's long-time feeling of confidence about the future.

This is one of the big reasons behind the President's plan for speeches around the country. As yet, there's no reason to look for any real change though, in the administration's tight money policy. The administration's worries don't come anywhere close to the feeling of panic; they're wondering, though, whether they can't take steps to avoid what might be a politically embarrassing slump of even a few months at just the wrong time—before next year's elections.

BAY STATE

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Detroit ... NEWS REPORT

Productivity calls the shots . . .

Back when ex-Defense Secretary Charley Wilson headed up GM's Delco Division, he would take any salesman that showed up at 8:00 am with him on his daily plant tour. If that salesman could prove to Wilson's satisfaction that his machine could increase productivity over any machine on the line, he got an order—no matter if the machine to be replaced was practically brand new. Wilson, to the dismay of his Accounting Department, reasoned that Delco simply couldn't afford to keep the old machine in place.

Auto industry economists say that Wilson's line of reasoning holds true today more than ever, now that the post-Korea expansion is over. Because of high-maintenance standards, machine tool depreciation won't be as much of a factor as it once was in auto capital goods spending.

Rather, every order except those resulting from engineering advances will be pegged on increased productivity. Reason for this is that Detroit today is caught in a squeeze between rising wages, rising material costs, and very real customer resistance to higher auto price tags.

Too, sales seem to be stuck on an unexpectedly low plateau of 6-million-or-so cars per year—low, that is, by boom 1955 standards but pretty good by any other yardstick. Of this 6-million total, Detroit figures 4 million cars are replacing, indirectly, those that are being scrapped.

The other 2 million, by Detroit standards, go to people who simply like to upgrade their cars frequently. These 2-million units justify the tremendous outlay for model changeovers.

Thus there is a ready market in Detroit for any machine that will increase productivity. This, of course, includes automated equipment. If such a machine can at one and the same time increase output and still allow the automakers to maintain the flexibility in retooling necessary to an industry whose product is constantly changing, that machine is assured of Detroit buyers, industry economists say.

Plastic surgery redefined . . .

In the last 10 years or so, the press has fallen into stereotyped use of the terms "all new" and "facelift" to describe the degree of change in a new car. Correct current interpretation: a facelift describes changes in any new car that does not boast a new body shell.

Take, for example, the 1958 Ford. It has last year's body shell—but its other changes are so sweeping that the term "facelift" hardly seems to apply. Ford claims to have spent $185 million to create its new offerings, with the new engine accounting for about $65 million of the total.

Allow another $20 million for such miscellaneous engineering improvements as air suspension, and that still leaves a pretty hefty $100 million for visible styling changes. Hefty when you consider that Hudson back in 1948 brought out its all-new "step down" model for about $18 million.

Maybe a new auto journalese term ought to be coined to describe new models in the future. "Major" or "minor" surgery might do the trick.

Reuther plays cat and mouse . . .

Walter Reuther's request of the Big Three that they reduce car prices $100 on 1958 models made headlines, as did the automakers' emphatic refusals. Then Reuther appealed to President Eisenhower to do something about it. The President, through a spokesman, politely declined to do any such thing.

Since then, Detroiters have been waiting for Reuther to make still another bid for public sympathy and support—a bid which might very possibly tip Reuther's hand as to what he's going to ask for in upcoming bargaining sessions.

Some Detroit cynics say Reuther's next move is being delayed because he himself doesn't know what it is. Others figure that UAW-CIO's cagey strategy board and press officers are waiting until Sputnik stops hogging the nation's headlines before doing anything.

While Reuther's next move is problematical, from here it looks as though it won't involve the threat of a big strike, even though UAW-CIO's strike fund will have grown to $24 million by contract negotiation time next spring.

But while this is a tidy sum and an added assessment similar to the $5 per month per member one levied in 1955 could result from the January convention and double the fund, there has been no talk of such a thing.

Most important no-strike weathervane to date: automakers aren't overproducing for the stockpile—something they would be sure to do if they considered strike a possibility.

Meanwhile, the UAW-CIO chief is letting Detroit puzzle over the newest Reutherism: "Raise wages, lower prices, create consumers."

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Aircraft and Missiles...

NEWS REPORT

Monthly payments won't go . . .

Most major aircraft producers are now negotiating new production stretchouts with the Air Force. The contractors have said they cannot stick to current delivery schedules under the recently-imposed limitations on monthly payments.

As of now, the Pentagon has no remedy for getting contractors out of the financial bind. The problem is this: the total anticipated billings by the contractors over the next nine months exceed—by some $1 billion—the Air Force's procurement expenditure ceiling.

Meantime, the Navy is in a similar fix. But instead of putting a firm limit on monthly payments, the Navy is holding private talks with major plane makers to revise procurement contracts. The first big cut resulting from talks: dropping of $21 million worth of contracts with Lockheed for production of 100 jet trainers and 15 radar warning aircraft.

The round of cutbacks, stretchouts, and cancellations has aircraft makers sizzling. A typical comment: "We're in trouble. What the US needs is a properly managed aircraft and missiles program that will allow all the businesses involved to prosper. What the program needs is not a high colonic, but some skilled surgery on the part of the Pentagon—and Congress."

There is no likelihood that the monthly payment ceiling will be rescinded, according to almost all observers.

The problem is more basic. At the heart of it is this: is the administration willing to push for an increase in the statutory Federal debt ceiling and thus allow defense spending to rise?

More cuts to come . . .

Meanwhile, the outlook is for another round of production cuts. Still another prospect is that many promising development projects—new supersonic manned planes, rocket engines, and the like—will never get into production unless there's an earthshaking change in current policy.

Most Pentagon experts figure defense spending this year will hit closer to $39 billion than to the $38 billion ceiling the administration has clamped on. They also point out that many of the highly-touted budget cuts to date have merely deferred expenditures rather than reduced the total. The reduced progress payments and deferred monthly payments, for instance, simply push expenditures back some months; the bills will still have to be paid eventually.

The conclusion is this: if military expenditures are to be kept at a fairly stable $38 billion level for the next year or two—which is still administration policy barring an unexpected Sputnik-stimulated change — some important contract cancellations still have to be made.

Foot-dragging period ending?

Defense contractors complain about delays in new contract awards and renewals of projects about to expire. Pentagon procurement officials concede that new orders have been held pending settlement of monthly payment restrictions and spending ceilings for individual projects. But now there's a sign of loosening up. The Air Force, for instance, has announced $183 million worth of new Titan ICBM contracts. The awards went to Western Electric, for radio inertial guidance gear; Aerojet-General Corp. propulsion units; and Remington-Rand for Univac computers. The companies have been working on research projects up to now. Presumably they've now moved into the production stage.

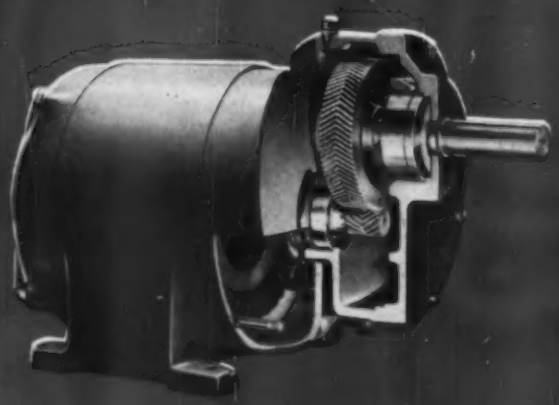
Sputnik "flap" still on . . .

While pressure continues to build up in industry, within the Pentagon, and Congress for a major overhaul of the ballistic missile program in light of Sputnik, the administration remains committed to running the show without any significant change in policy.

Still, many military men are now optimistic about the future of projects hurt by the economy drive—notably R&D projects. They're not necessarily looking for a change overnight, however, nor do they expect a major policy upheaval—that is, a big boost in money. What these officials are talking about is a change of attitude in high places which they hope will eventually be reflected in specific action.

An Air Force General puts it this way: "I'm more optimistic about relief from the budget squeeze now than I was before Sputnik. We talk about 'B.S.,' before Sputnik, and 'A.S.,' after Sputnik, in our shop. Sputnik has jarred some people. Those who have ridiculed military research in the past are going to have to look at things in a new context."

Says a Navy scientist: "In the past six months, they've been tearing out extra telephones around here, restricting out travel money, not allowing us to hire new people. Maybe this sort of thing will change now."



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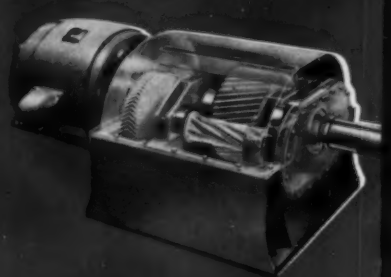
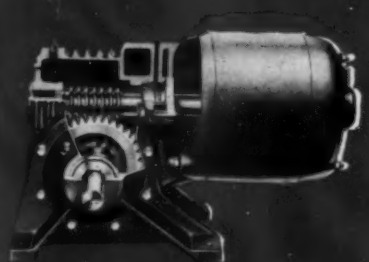


DOUBLE REDUCTION
Parallel Shaft Type



SINGLE REDUCTION
Right Angle Shaft Type

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Machine tools ... NEWS REPORT

Imports cause concern ...

Imports of machine tools are causing increasing concern in the machine tool industry as domestic business shrinks.

They amounted to $19 million in the first seven months of this year, according to Niels A Olsen, Acting Director Metal Working Equipment Division, Business and Defense Services Administration, in his address to members of the National Machine Tool Builders' Association recently.

Imports in the January-July period were about 3.3% of total shipments, compared with 1.9% in 1955, when some $12 million of metal-cutting machine tools came into this country. Imports of metal-cutting machines rose to $19 million in 1956. And this year they will be much higher.

The same rising trend shows up in imports of forming and shaping machine tools, Mr Olsen disclosed.

The volume of imports in the first seven months of this year rose to $5.8 million, or 2.6% of all shipments, whereas in the calendar year 1955 it totaled $4 million, or 2%.

Radial drills and light engine lathes are two areas in which foreign builders have been able to make impressive inroads in the domestic market.

Two British builders have made the biggest dents in the radial field. And at least one British company has been selling a lot of small engine lathes in this country.

The British, however, are not the only successful invaders of the American market. Some German and Italian companies have had a certain amount of success too. And a group of French builders of general purpose machines now have their own U S sales company soliciting U S machine tool buyers.

West Coast heavy import buyer ...

The Pacific Coast has been one of the more lucrative areas for foreign builders. A large number of small firms, to whom low price is especially alluring, have bought foreign machines in the past year.

The entire West Coast, more particularly Southern California, **is dotted with small shops, each** of which is viewed by foreign builders as a good prospect.

But European builders have also been successful in selling their machines to the larger metalworking companies. At least one British builder has been circulating for some time a list of its West Coast customers—a very impressive list. The number of U S distributors handling one or more lines of foreign machines is growing.

Some foreign builders who have stayed out of the market here are now eyeing it with interest. One is a British builder of automatics.

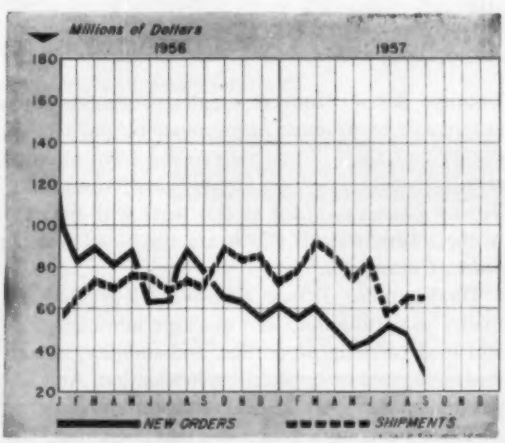
A handful of foreign makes of machine tools, notably some Swiss machines and a few German, have had a relatively good sale in U S markets for many years (except for the interruption for the German makes through World War II and up to a few years ago).

Aside from this small group, foreign builders now doing well in the U S domestic market are pretty much newcomers.

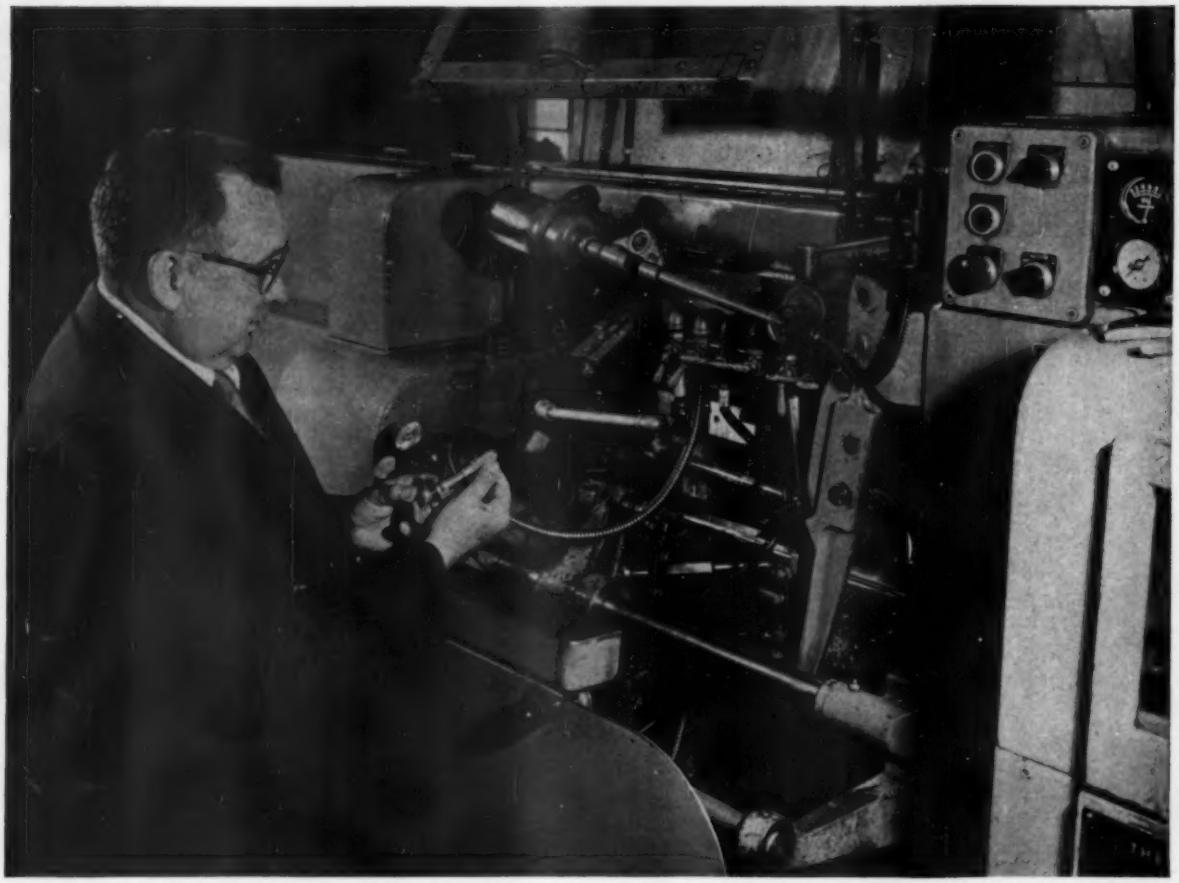
At least several European companies are competing in this country primarily against used U S machine tools rather than against new domestic tools.

The machines that they offer are simple and low-powered. Their price is far under that of new American machines. The aim is to interest the small shop which has very small financial resources. This sales strategy has worked out well along both the west and east coasts.

BF



New orders for machine tools declined in September to $28.85 million from August's $44.5 million, as shipments rose slightly in September to $64.6 million from $63.2 million in August. Estimated backlog for the industry, according to the National Machine Tool Builders' Association, dropped from 4 months to 3.7 months



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for Triangle Screw Products, Dayton, Ohio

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LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

What's ahead ... in Metalworking

NEWS REPORT

Steady production in a time of uncertainty . . .

Despite stock market fluctuations and a general air of "What's going to happen now?" in business, U S industrial production continues to maintain the same steady pace it has held for more than a year. As recorded on the *American Machinist* Index of Metalworking Production, October's output varies only a point or two from last year's figures with, paradoxically, the "Other transportation" category (which includes the hard-hit aircraft industry) chalking up a decided lead over year-ago figures, and a jump of 38 index points in a single month.

But whether Metalworking will continue to maintain high levels of output over the next few months is a matter of conjecture. Two weathervanes of production, steel orders and cutting tools, indicate that it will not.

The customary October pickup in steel orders has failed to materialize, and steel industry estimates of fourth-quarter outlook are being revised downward. Minor slowdowns in steel sales are reported from scattered areas, with most of the pickup failure attributable to the automotive and appliance industries. But general metalworking continues to buy well, farm implement steel sales are better than last year, and the steel people are pretty generally agreed that overall 1957 will be a "good" year for steel.

Cutting tool sales outlook is spotty and uncertain. One maker reports sales have failed to make their normal autumn pickup, says outlook is "pessimistic" for the rest of this year and first half 1958.

On the other hand, another cutting tool manufacturer reports size of orders is bigger today than it was last year, expects that when the auto companies really get rolling on the '58 models, sales will pick up considerably.

But metalworking plants of all kinds are in the midst of drives to cut back inventories of raw materials and finished products.

Tool and diemakers are becoming increasingly pessimistic over future prospects. National Tool & Die Manufacturers' Association reports that only 2% of its membership views the outlook as "excellent" this year, compared with 14% last year; "goods" are down from 64% to 27%. "fairs" are up from 20% a year ago to 50% today; and "poors" are up from 2% to 21%. Primary reason: slowness of auto orders.

While the foregoing reports from several bellwether industries would indicate that the metalworking outlook for the next several months is uncertain, this is perhaps not a wholly realistic picture. It is not so much a drop in volume of sales that they reflect as it is a change in customer buying habits.

Because no shortages are anticipated, metalworking companies today are buying from day to day, rather than stockpiling tools and materials as they have done in recent years. Consequently, even though backlogs of most metalworking suppliers have dropped sharply and size of individual orders has shrunk, metalworking is still operating at a high rate by any standards. The market is still here—too many people have forgotten that business can still be good without huge backlogs.

175

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	OCT. Estimated	SEPT. Preliminary	AUG. Revised	SEPT. Year Ago
Total Index	**175**	**174**	**177**	**176**
Machinery	148	151	157	
Electrical Machinery	206	212	212	
Autos	92	120	92	
Other Transportation	408	370	391	
Other Metalworking	146	147	148	

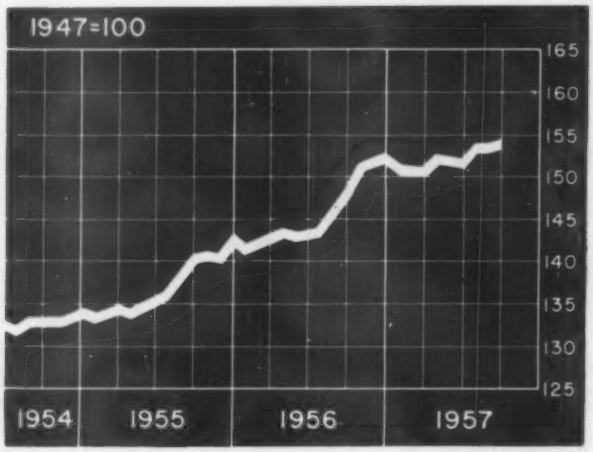
NEWS REPORT

What's ahead:...in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	OCT. Estimated	SEPT. Preliminary	AUG. Revised	SEPT. Year Ago
Total Index	**154.2**	**153.9**	**153.4**	**147.5**
Metalworking Machinery	179.6	178.4	170.5	
Other Machinery exc. Electrical	163.7	162.7	155.3	
Electrical Machinery	156.4	155.7	147.8	
Fabricated Metal Products	144.5	144.4	140.0	

154.2



Washington dilemma–how do you lure the boom back?

Governments, like individuals, are susceptible to changing moods. This process is what is now happening to the Eisenhower administration. Fall, 1957, is not a happy, confident time in Washington, despite the fact that the nation heads for the year's end with high economic marks in sight.

"Sputnik diplomacy," a war threat in the Middle East, is alone enough to make the Capital's psychology tend to the gloomy side.

Business confidence wavers, and that disturbs Washington above all. It's a fair statement of fact that the Capital's optimism about 1958 is notably dimmer than it was a mere few weeks back. Government economists are second-guessing themselves.

Business plans can't help being affected, so they're telling themselves, by Sputnik, the Middle East and by the stock market slide of late October (which incidentally was bigger than anyone in Washington would have expected).

A fair question: what will Washington do about all this? Personal reassurances will come from the President himself. Awareness of the uneasiness in the land is behind his decision.

And behind the scenes a debate goes on about such basic policies as hard money (is it time to ease up credit restraints a bit?), and public works (should they now be encouraged just a little bit more?). It all adds up to this: should Washington make its move now, or soon, to put the boom back in business?

A time for decisions draws near. The answers that come out of Washington between now and next January (when Eisenhower sends his annual series of messages to Congress) will mean much to business and the entire U S community. They'll tell the tale of future money costs and a tax cut, and they could establish an entire new economic mood.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	141.8	141.0	148.3
Steel ingot operation (thousands of tons)	2,045	2,070	2,491
Electric power output (million Kilowatt hours)	11,684	11,709	11,333
Production of automobiles and trucks	94,387	59,847	117,930
Engineering construction awards (Eng. News-Record—millions)	$359.6	$312.3	$550.5

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	144	145	144
Index of durable manufactures production (1947-1949=100)*	159	162	162
Durable goods manufacturers' sales, millions*	$14,184	$14,573	$13,723
Machinery manufacturers' sales, millions*	$ 4,235	$ 4,447	$ 4,143
Durable goods manufacturers' new orders, millions	$13,060	$13,005	$17,342
Machinery manufacturers' new orders, millions	$ 4,203	$ 4,065	$ 4,360

* Seasonally adjusted

Automatic feeding and setting with...

T-J

Speeds up riveting and clinching!

It's a quick step to *faster assembly* and *reduced labor costs* when you put T-J Rivitors and Clinchors in your production picture! These performance-proved machines are suited to a wide range of assembly jobs for aircraft, automotive, farm machinery riveting jobs of all kinds.

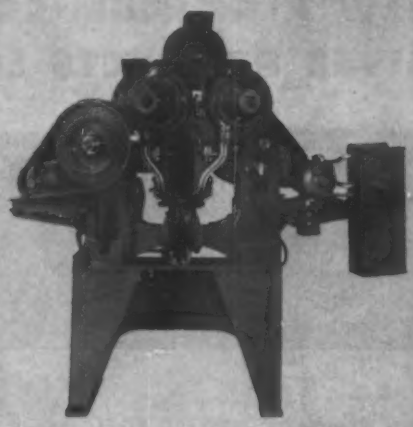
T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to 7/8" long. Throat depths 8" to 36".

T-J CLINCHORS set clinch nuts with fully automatic operation, controlled by a single foot pedal. Available in Underfeed and Gravity feed models, throat depths 8" to 36".

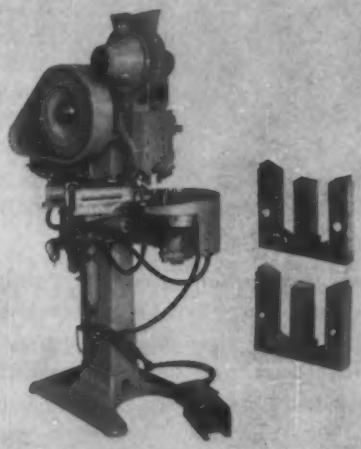
Send today for these helpful references: Rivitor bulletins 646 and 555 . . . Clinchor bulletin 555. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON

RIVITORS · AIR AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHORS



RIVETS 4 AT A TIME! Special quadruple riveting unit, incorporating two Model "RR" Twin Rivitors, mounted on a special welded steel base. Equipped with air-operated hold-down mechanism and a safety air trip arrangement. Tooled for riveting left hand and right hand automotive muffler bracket assemblies.



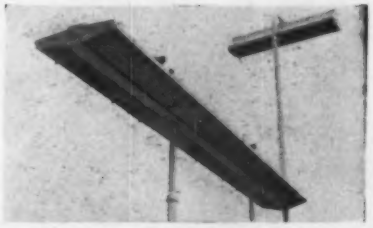
SPECIAL TWIN RIVITOR! Tooled for 6 station indexing fixture, incorporating automatic clamping and ejecting mechanisms, for riveting laminated armature assemblies.

T-J CLINCHOR adaptable to a wide range of clinch nut setting problems. Gravity feed model shown here.

NEW ALUMINUM-COATED STEEL GIVES PRODUCTS LONGER LIFE, CUTS COSTS

Armco ALUMINIZED STEEL Type 2 provides low-cost corrosion resistance, eliminates need for paint.

New Armco ALUMINIZED STEEL Type 2 combines the strength of steel with the durable protection of a tightly adherent hot-dip aluminum coating. This unusual combination of metals offers economical corrosion resistance, high heat reflectivity and the opportunity to cut fabrication costs.

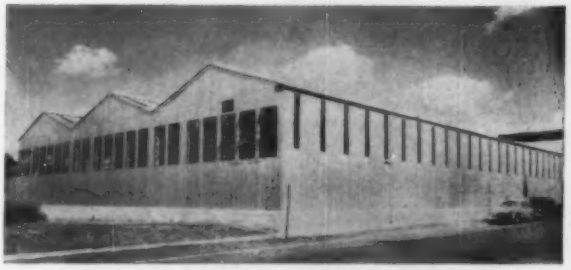


OUTDOOR LIGHTING FIXTURES, SIGNS

OVENS, BOILER SHROUDS

15-year tests in industrial atmosphere show that the life of the coating on ALUMINIZED STEEL Type 2 is at least 3 times that of an unpainted zinc coating on commercial galvanized steel sheets. The tests were conducted before this 2-in-1 Armco Steel was put into commercial production.

Reduces fabrication costs, too. The attractive coating on ALUMINIZED STEEL eliminates the need for paint or other surface protection. You can make substantial cost reductions by cutting entire operations from production schedules.



BUILDING PANELS, ROLLING DOORS, AWNINGS

INSULATING PROTECTIVE COVERS

Give your outdoor products extra corrosion resistance at low cost. Specify Armco ALUMINIZED STEEL Type 2. This special Armco Steel is produced in sheets and coils from 13 to 28 gage and in the form of corrugated sheets and welded tubing.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

How Does Your Shop Measure Up?

Metalworking is pouring billions of dollars a year into research and development. Its outlay for this purpose is far more than it was only a few years ago. And it is expected to grow year by year.

New metal products of all kinds are coming onto the market at an ever-accelerating pace as a result of the constantly expanding research and development work. New technological processes, new wonderfully productive machines, and new ingenious and improved materials are appearing like magic. They are available for manufacture of these new products.

Production costs are rising . . .

and hourly wage rates are going up annually. Nothing is likely to stop their upward flight. Prices of materials and components are going up too. Yet makers of end products are finding it harder and harder to raise prices because business-getting is more competitive and because they don't want to price themselves out of the market. Profits will suffer unless costs can be pushed down.

Altogether, it sounds like a perfect setup for favorable decisions by management to replace old equipment with new. Some manufacturers, to be sure, are alive to the situation. A special survey by *American Machinist* discloses this fact.

Metalworking firms will spend . . .

one billion dollars between now and the end of 1958 for new machine tools. This total is arrived at, by the way, with small help from the automobile industry. For the detailed story, please turn to page 170.

Despite the awareness of some metalworking managements, as shown by these projected expenditures, too many companies seem content to let matters drift. Their shop equipment is getting older and older.

American Machinist estimates that some 68% of the metal-cutting machine tools in metalworking plants today are 10 years old or older. That is a startling setback since 1953, when the ratio was 55%.

The situation in metal-forming machine tools is almost as bad. Some 65% of them are 10 years or older, as against 57% only four years ago.

In the midst of unprecedented progress in research and development, and under pressure of rapidly mounting costs, this is a miserable showing. Metalworking's production equipment is getting older fast. Its state of obsolescence is out of keeping with the up-to-dateness of technological advances.

There is only one sensible way . . .

to go about correcting this unsatisfactory situation. That is for every metalworking management to examine the condition of its own production equipment and measure against it the benefits to be derived from replacements by new machines.

Then it should establish a continuing replacement program that will help to keep its manufacturing departments producing work of high quality at minimum cost.

Burnham Finney EDITOR

Cincinnati Press Brake Dies

A COMPLETE CINCINNATI ENGINEERING SERVICE

COMPLETE DIE SERVICE

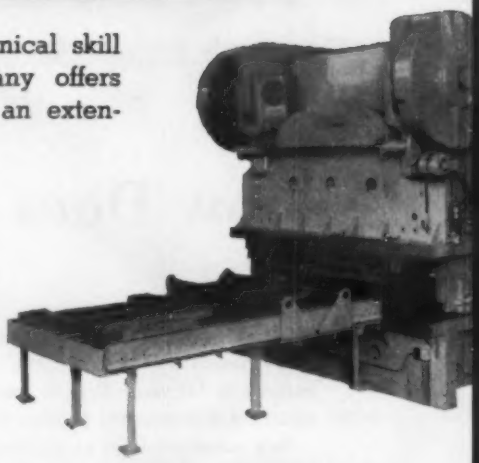
Selecting the proper tooling for a job requires the best technical skill and experience available. The Cincinnati Shaper Company offers complete facilities for designing and manufacturing dies for an extensive variety of products.

APPLICATION ENGINEERING DEPARTMENT

Our Application Engineers stand ready to give your production problems individual attention. A background of 30 years of widely varied experience is represented in this department.

DIE MANUFACTURING

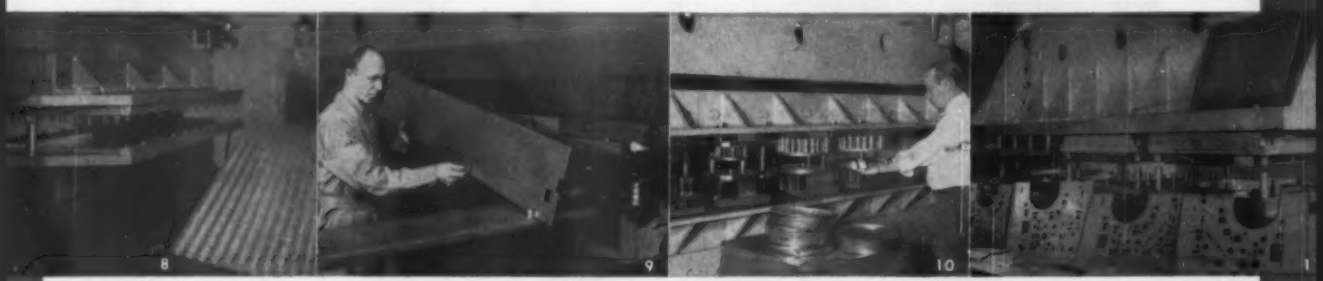
We have machining, assembling and testing facilities for producing high quality tooling . . . for any Press Brake work.



This Cincinnati Press Brake punches and corrugates simultaneously. It is equipped with automatic feeding and withdrawal units.

A typical 4-way die, equivalent to 4 single vee-dies, is shown in photo 1. Photo 2 shows a gooseneck die and photo 3 shows a special die for producing 16 gauge molding. The closed U bend shown in photo 4 is formed in 3 hits.

The dies shown in photo 5 form corrugated culvert sections in successive hits. Steel roof decking is made with the "double-decker" dies shown in photo 6. The setup shown in photo 7 produces 2 miles of galvanized gutter per hour.



Tooling for punching grain bin sheets is mounted on special bolsters in photo 8. Spring plungers are used for strippers. Four edges of a control cabinet blank are punched and notched on the setup shown in photo 9.

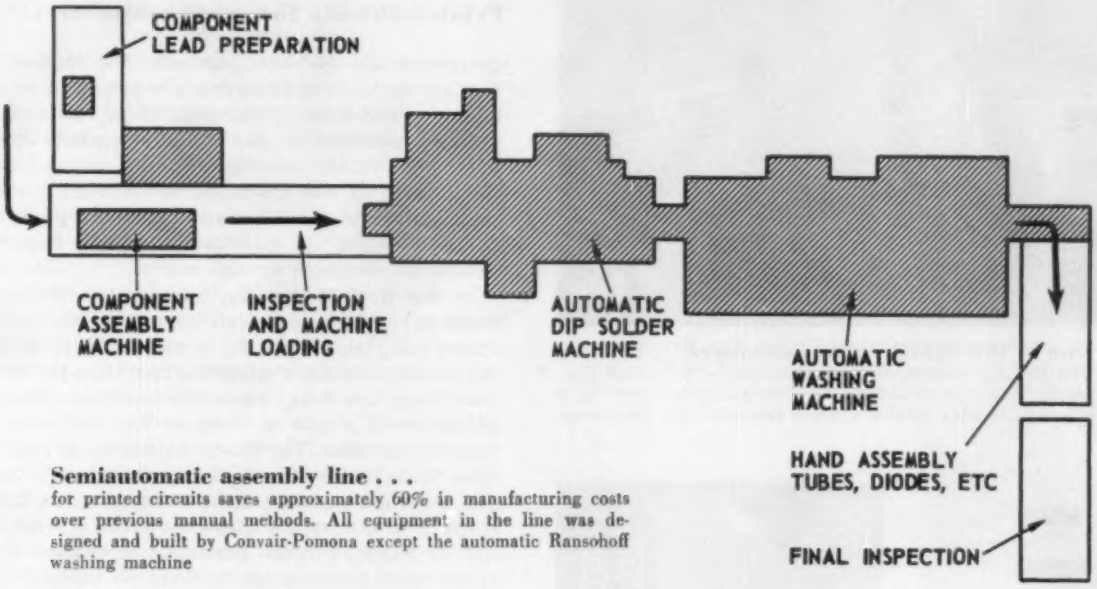
The progressive die setup shown in photo 10 is used for punching and drawing switchboard parts. Photo 11 shows a progressive die setup for producing television chassis.

The photos on this page show just a few samples of the Press Brake tooling and material-handling equipment designed and furnished by the Cincinnati Shaper Company. For more information, write Department A for Catalog D-2.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS · SHEARS · PRESS BRAKES



Semiautomatic assembly line . . .
for printed circuits saves approximately 60% in manufacturing costs over previous manual methods. All equipment in the line was designed and built by Convair-Pomona except the automatic Ransohoff washing machine

Printed circuits for guided missiles . . .

. . . are assembled on semi-automatic lines at Convair's Pomona (Cal) Missile Division. Change-over from hand wiring to the printed circuits eliminates errors, reduces costs, and greatly increases the reliability of the Navy's latest guided missile—the "Terrier"

American Machinist

E D HELLER, manager,
MANUFACTURING DEVELOPMENT
DEPARTMENT, CONVAIR-POMONA,
A DIVISION OF GENERAL DYNAMICS CORP

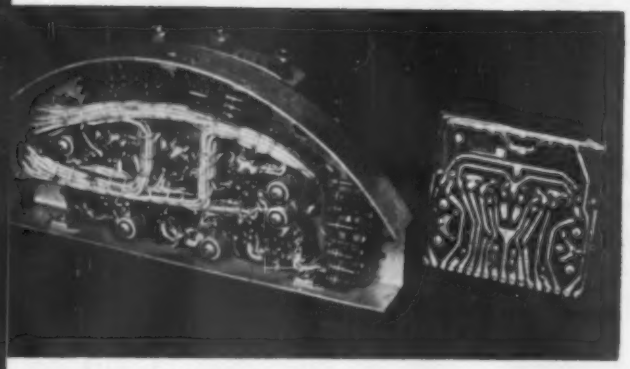
The surface-to-air guided missile "Terrier" was the first to become operational with the US Navy and is now being delivered to the US Marine Corps for land duty. For some time, this 33-ft-long, solid-fuel anti-aircraft missile has been in full production at the Pomona, California, Guided Missile Div of Convair, a Division of General Dynamics Corp.

Mass production of these complex weapons brought about a number of manufacturing problems. Among them was the need to eliminate all errors in wiring electronic components—to provide the highest possible degree of reliability in the function of the completed system. Printed circuits were the answer here, because they cut out numerous hand operations —thereby eliminating a major source of errors. With these devices, it was also possible to develop semi-automatic production lines to reduce manufacturing costs and increase production rates.

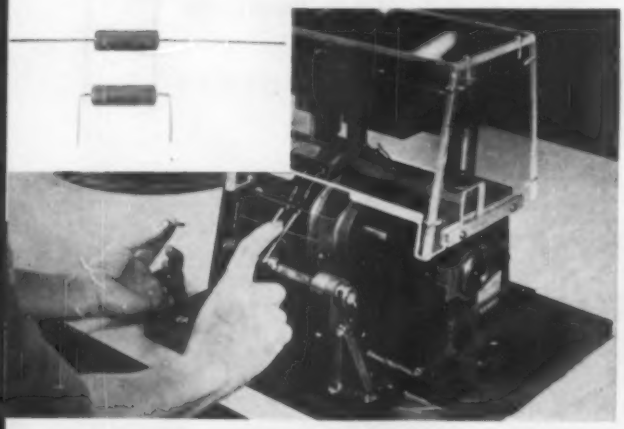
SAVINGS OF 60% . . .

. . . approximately, are gained with the new line as compared with previous manual methods. Operations

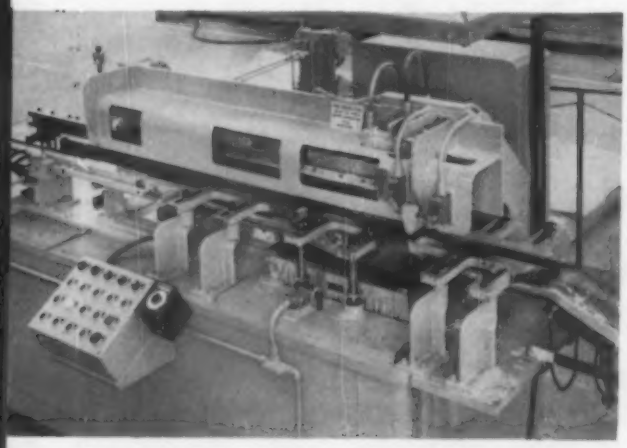
CINCINNATI 25, OHIO, U.S.A. SHAPERS · SHEARS · PRESS BRAKES



One of the etched circuits compared . . .
with the old electronic-component package at left which it replaces. New circuit, designed for semiautomatic assembly, is considerably more reliable and less expensive than the old one



Leads are trimmed and bent . . .
to form parallel legs at right angles to the axis of the electronic component (inset). Air-operated machine indexes parts past die, is adjustable for length of leads and location of bend



Six-station, in-line transfer machine . . .
automatically dip-solders clinched leads of electronic components on printed circuit boards. Assemblies are manually loaded on walking beam transfer rails that carry them through soldering and cooling stations. The machine is capable of cycling an average of six circuit boards every 16 sec

Printed circuits for guided missiles . . .

performed on the semiautomatic line include retinning the leads of electronic components and then trimming and forming them; installing resistors, capacitors, condensers, and other electronic devices with axial leads; shearing, bending, and clinching these leads on the underside of the circuit board; soldering the trimmed leads to the circuit path; and, finally, cleaning the assembly to remove flux, contaminants, and other foreign matter.

At the start of the line, an operator re-tins the leads of resistors or other components manually to insure acceptable soldering to the circuit paths during the automatic dip-soldering operation performed later. They are then loaded into notches around the periphery of a pair of disks in the trimming and forming machine. The leads, extending beyond the outer faces of the disks, are gripped securely in the notches while a ratchet and pawl mechanism indexes them to a trim die. Here the leads are cut to a specific length, and the continued downward travel of the trim punches bends them to form parallel legs at a right angle to their normal axis.

ASSEMBLY AND CLINCHING

Once the components have been inserted in the circuit board by hand, the final trimming and clinching are performed automatically by a special machine. Labor-cost saving with the new setup is about 70% compared to the old completely manual operation.

The machine consists primarily of an assembly-and-clinch die with power and control units. The upper portion of the die unit is made up of a holding clamp with a molded rubber pad. The lower assembly consists of a base with a self-contained slide to which is attached a shearing blade. A universal die, perforated with holes making a 1/10-in. grid, is installed in the base, and over it is bolted a "nest," made to suit the contour of a particular circuit board. Two hydraulic cylinders, limit switches, pump, and controls make up the power unit.

Circuit boards are designed so that the lead clearance holes conform to a 1/10-in. grid, and the "nest" holds the board in alignment with the holes in the die. Thus, the component leads can be inserted through the holes in the board and the die plate, a manual operation.

When both the left and right switches are activated, the clamp comes down to secure the assembly, and then the shear blade starts to slide forward. Travel of the blade clips the lead ends, which are then clinched securely against the underside of the board by continued forward motion of the slide.

AUTOMATIC DIP SOLDERING . . .

. . . follows in a special, electrically operated, hydraulically controlled six-station, in-line transfer machine which receives the assemblies and automatically solders the clinched component leads to printed circuit paths. This part of the system has proved so successful that the whole line may be

made fully automatic in the future with the addition of transfer and feed mechanisms.

The machine can be adjusted to accommodate a particular printed circuit assembly by moving guide rails in or out to conform to the dimensions of a setup templet. After such an adjustment, parts are manually loaded into guide slots that mate with grooves in the transfer gide rails. Several circuit boards can be loaded adjacent to each other to fill all of each station, and cycling of the machine may be automatic or manual—depending upon the volume of parts to be processed. When the control panel is on "manual," any discrete phase of the cycle can be activated independently of others.

Transfer of assemblies through soldering, cooling, and unload stations is fully automatic, and progression of parts is continuous. An overhead transfer bar, operating on the walking-beam principle, is lowered by a hydraulic cylinder to traverse the parts forward, pushing preceding work to the next station. A photoelectric cell senses the presence of circuit boards in the various stations, so that cycling is continuous as long as there are parts in the machine.

At the soldering station, a section of the transfer rails holding the printed circuit is lowered into the solder pot so that the molten solder contacts the circuitry and crimped terminal leads on the bottom of the board. After a short dwell, the assembly is jogged up and down to permit escape of entrapped gases and to assure solder coverage in all areas. At the end of this phase, the guide rails and assemblies are raised and returned to the transfer position. Motion of the dip station is supplied by a cam mounted under the machine table. When the transfer bar completes its forward stroke, a solenoid-braked motor is energized and the cam lowers the assembly to a point just below the surface of the solder. Washing of solder over the top of the board is prevented by surface tension. In the final stages of its rotation, the cam raises the dip station to the normal position—aligning the assembly with the ways in adjoining stations.

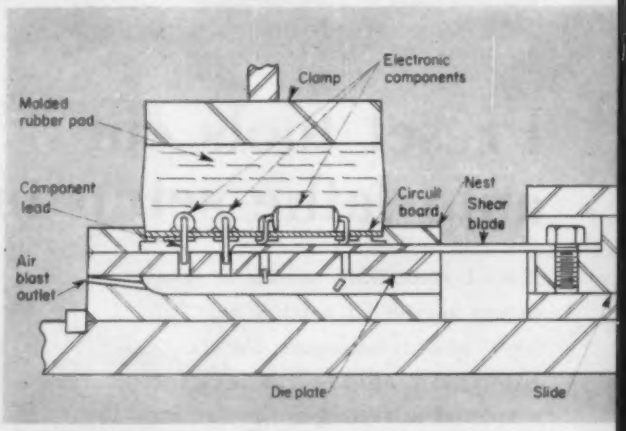
The level of the solder in the pot is important, of course, and may not vary more than plus or minus 0.015 in. Adjustment of the level is signalled by an indicator light so that solder, in the form of pellets, may be added as needed.

At present, "Carbo Wax 600" (polyethylene glycol) and Stabellyte resin are used to cover the pot for the solder bath and to prevent formation of dross. A warm-up period of one hour (considered as part of setup time) is required to transform cold solder to its molten state at 450° F, plus or minus 15°.

AUTOMATIC WASHING . . .

. . . follows soldering and is performed by a special Ransohoff, Inc machine. Here the work travels through an enclosed steam spray, solution spray, drain, rinse, drain, hot blowoff, and unload. Circuit boards are transferred through the washing operations between adjustable guide rails and are sprayed from top and bottom. Electrically heated drying air is supplied by a turbo blower.

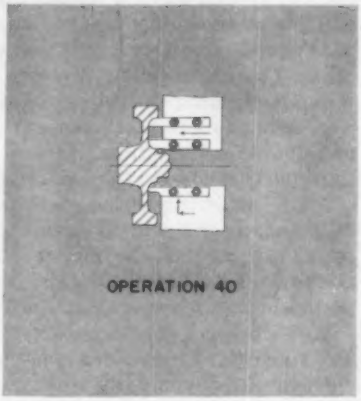
Components and circuit board are assembled . . . and clinched on air-operated machine after component leads have been manually inserted through proper holes in board. Circuit holes line up with grid holes in die plate



One swoop shears and clinches leads . . . to bottom of circuit board. Blade is shown in mid-stroke. Leading edge is about to clip 3rd lead; follow-through will clinch it against the board

Dip-soldered circuit board, ready for cleaning . . . in automatic washing machine, after which tubes, diodes, or other components are added manually, and the completed circuit board is inspected in the line

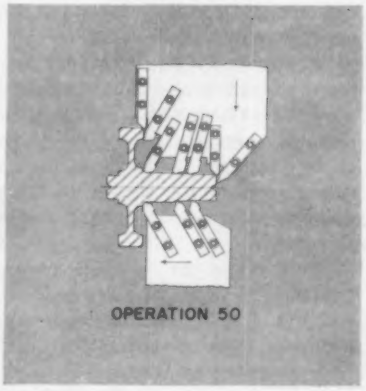
Magazine plates on front and rear slides . . . carry tools when Western Gear Works does six turning operations on 300-lb gears. Machine is a Gisholt No. 24 automatic production lathe with a 50-hp motor, but it delivers 80 hp for heaviest cut on this work. Gear blanks are forged steel and include integral shafts. OD is 16¾ in. and length is 14½ in.



Preset tools cut auto-lathe setup time

JOHN L ANDERSON, supervisor of estimating,
GISHOLT MACHINE CO, MADISON, WIS

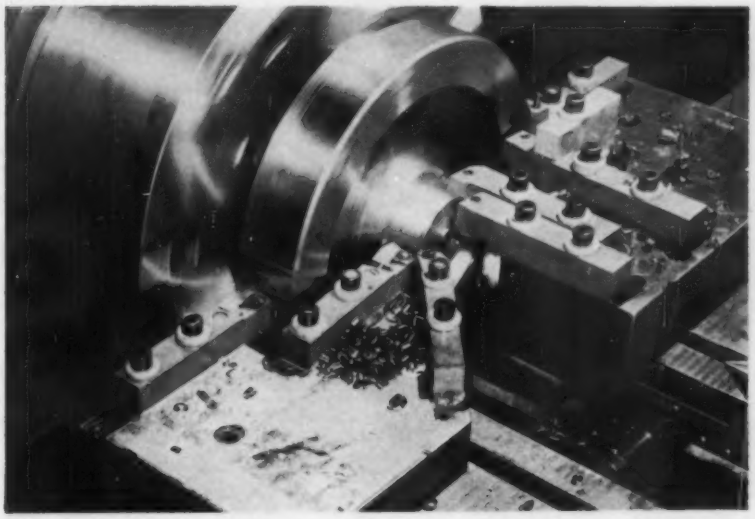
Interchangeable tool blocks for production lathes have a special advantage; they reduce the minimum economic lot size so an automatic lathe can often compete with manually controlled turret or engine lathes, even on short jobs. This is in addition to the obvious advantages of reduced operating costs, reduced scrap, and easier operator training



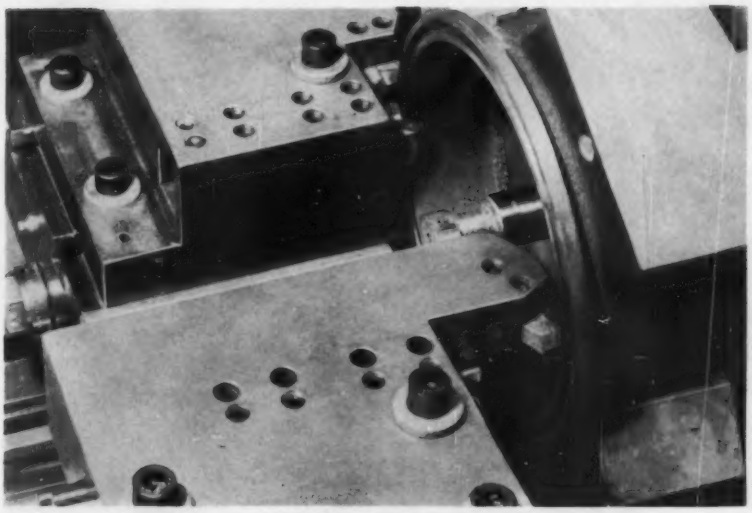
Tight tolerances increase the advantages of multi-tool magazine toolblocks, because operators will not have to reset the individual toolbits by trial and error or with setting gages if the whole magazine is adjusted in the toolroom. HSS, brazed-carbide, or clamped-on-carbide tools are being handled this way in increasing numbers. However, the so-called throwaway carbide bits are generally mounted in their regular holders, not in magazines or holding plates, because the holders permit quick changes in cutting edges without disturbing the tool setting.

Several methods of assembling cutting tools into magazines or plates are possible, as illustrated. Toolholder shanks can be clamped in conventional slotted toolblocks, or they can be bolted on top of the machine slide. With a mounting plate it is usually preferred to elongate the clearance hole through the toolholder and to machine a slot in the plate so the tool angle will be fixed but the longitudinal location can be adjusted to bring the tool tip to a setting gage.

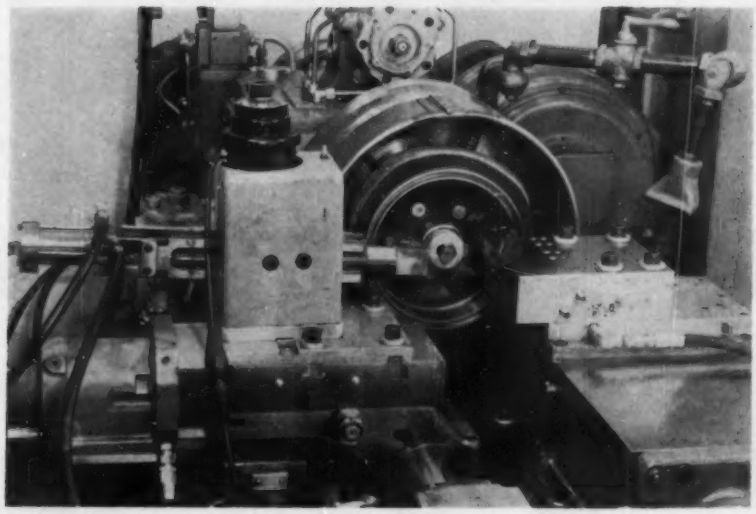
Screw-adjustment backstops for the toolholders allow locating one or more toolholders on machine slides separately from the tool magazines. If this is not necessary, the toolholders can be located by means of fixed blocks or pins.



Tools for Western Gear job . . . are clamped, and toolholders are bolted to magazine plates. Adjustments are made by setting carbide bits to precision gages in toolroom. Toolholders have long slots through which bolts pass, and which allow longitudinal adjustment



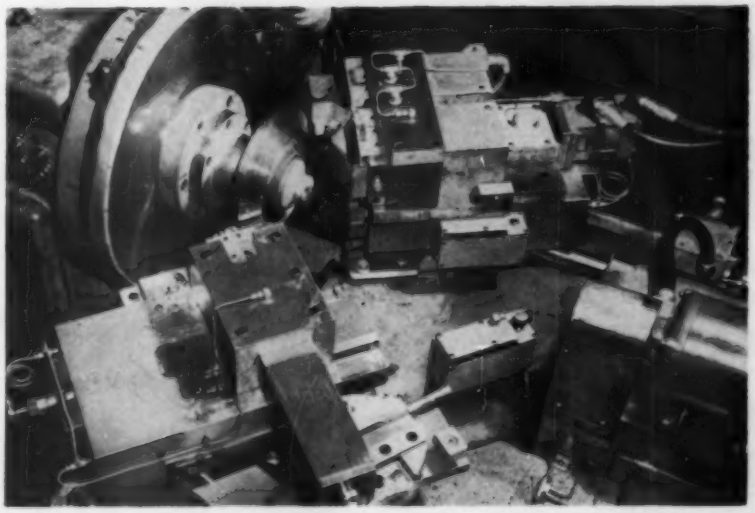
Slotted magazine blocks carry tools . . . for turning CI brake drums and front-hub assemblies for trucks Operation here is rough-boring and grooving rim face with rear-slide tools and facing and chamfering with cross-feeding front slide. No. 12 Gisholt lathe holds work in 3-jaw air-operated chuck. Drawbar for second operation remains in position during these cuts. After rough machining, machined hub is pressed and riveted in place; then drum is finish-machined



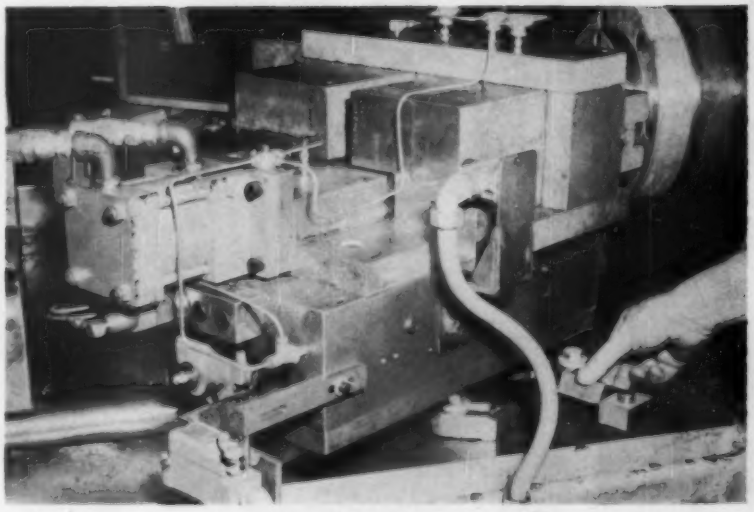
Second operation on brake drums . . . uses drawbar to hold work by hub ID—with chuck removed. Vibration damper is mounted around casting OD. Magazine block on rear slide finish-bores ID and rim groove with carbide tools, and front slide carries superfinishing attachment to produce 25-30 mu in. on bored braking surface. Time for roughing: 2.6 min; for finishing: 3.0 min

Preset tools cut auto-lathe setup time

Heavy grooving cuts are made by tools in magazine plates . . . on forged-steel cutter bits for oil-well drilling. Toolholders are located in grooves on top of each magazine plate; adjustments are made with screws that act on toolholder shanks. Magazine plates can also be adjusted on top of slide. Both slides make cuts simultaneously, so Gisholt Simplimatic has 60 hp. Three sets of magazine plates are interchanged for different work sizes



Bevel-gear blanks in 11 sizes are turned . . . on Gisholt Simplimatic at Harnischfeger Corp. Front slide is controlled by adjustable cam to rough and finish face angles. Swivel-base rear slide holds two multi-tool straddle blocks that turn the OD, counterbore angles, and break corners on gear blanks. Both slides have automatic tool relief



Master gage blocks . . . locate between fixed locating stop and rear-slide swivel base to set slide angle. Other blocks between this stop and a gaging pin extended from the adjustable cam assembly set the front-slide angle. Eleven gear blanks range in yearly production from 60 to 1800 pc, and in lot size from 20 to 200 pc. Floor-to-floor time is 2-2.3 min

Depth perception improves inspection

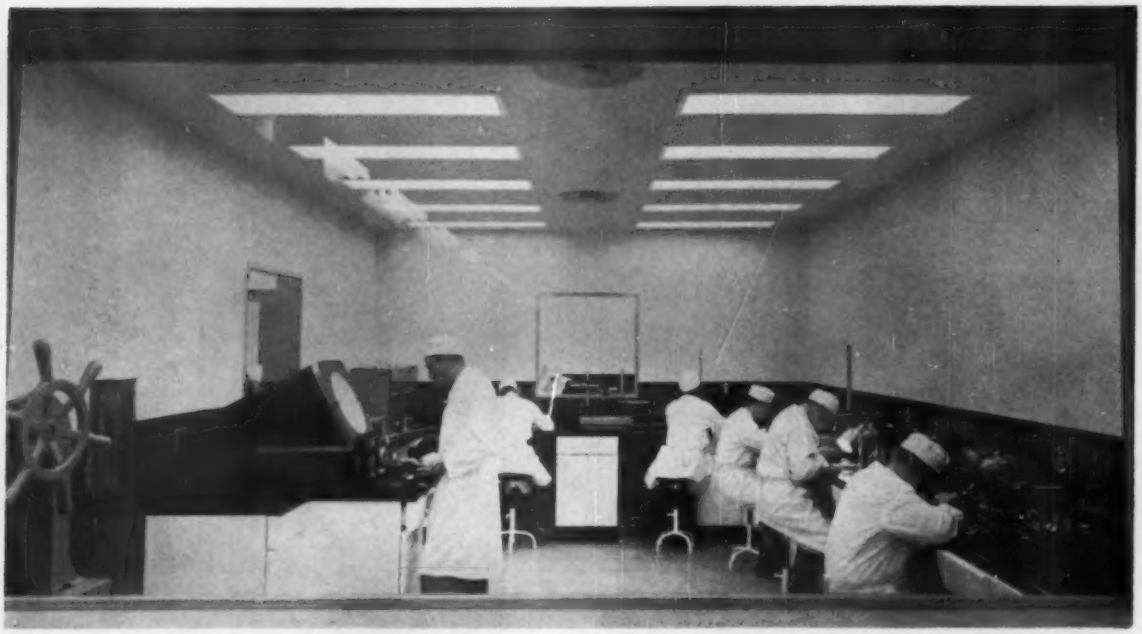
3-D effect of the stereomicroscope changes eyestraining inspection tasks on small parts into routine operations

Both ID and OD surfaces of bearings are inspected for pits, scratches, porosity and poor finish

Balls are individually inspected under the stereomicroscope before being loaded into the retainer assembly. Ex-Cell-O engineers devised the special fixture shown here to revolve balls under the microscope objective so that their entire surface may be examined

Porosity, pits, scratches, and other surface defects can't be tolerated in bearing races intended for precision grinding spindles. Ex-Cell-O Corp, Detroit, requires a 100% check of all races from ⅜ to 3½-in. dia on both ID and OD. Balls are similarly inspected before assembly into retainers.

Inspection time and inspector-training time have been reduced, and quality increased on inspection of spindle bearings and other small precision mechanisms by use of Bausch & Lomb stereomicroscopes. These are 2-headed microscopes that provide the 3-D, or depth, effect of human vision. With normal perception plus variable-power magnification, the operator is able to see and identify defects in bearing races and other small precision parts, and to align, adjust or measure as easily as with larger parts. Eyestrain and tension are removed from the seeing task. Ex-Cell-O reports: "The combination of magnification and true depth perception offered by the stereomicroscopes is ideal for critical surface inspections." Defects which had been all but invisible through the standard laboratory microscope can be seen with ease through the lower-powered stereomicroscope—as a result of the three-dimensional vision offered by the instrument. The device has long service life.

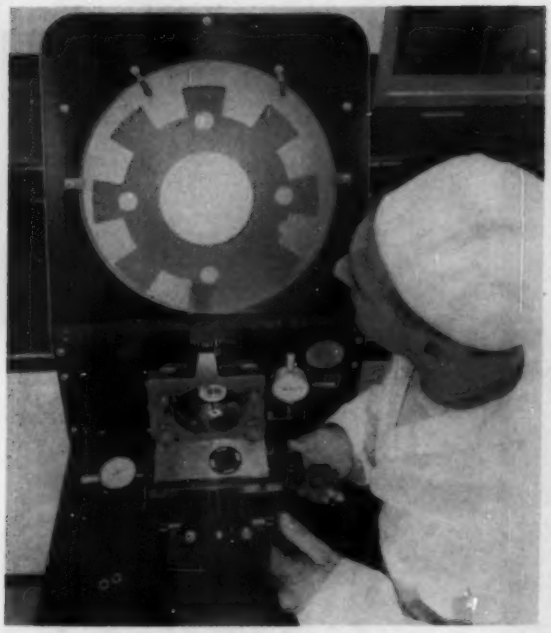


Technicians enter this room through tightly sealed airlocks, after washing and donning lint-free Orlon caps and gowns. Some of the miniature HIG's (hermetic integrating gyroscopes) produced in this laboratory are no larger than a man's thumb, yet they contain 250 precision-machined parts. "Pushthroughs," as in wall behind comparator, are used to remove or receive components or assemblies. Temperature is 72F±2°; humidity is 45%±5%; filtration is 0.3 micron. "Clean" room is entered in three stages—associate room air is filtered to 5 microns and primary "dirty" rooms are provided with 20-micron filtration. Air is pressurized at about 0.2-in.-of-water differential from "clean" to "dirty" to cause air flow out of clean room

Metalworking's "brain" surgeons operate to 0.000010 inch

Dynamic balancing of gyro wheel is accomplished on this ultra-sensitive machine built by Micro Balancing Inc. Also, rotor being tested is self-rotated by electronic excitation, hence external forces from the conventional driving wheel (with handle) are avoided. Rotor shown is balanced to better than 10 mu-in. ounces. Drill depth required for balance is shown on right-hand meter

Dentist's drills are used, along with other dental instruments, for delicate deburring operations. Many operations require the use of a high-power stereomicroscope. Parts are individually packaged, and packages are kept in closed containers, while in process. Technicians selected for this work are especially trained to provide maximum dexterity and versatility



Optical comparator is used to inspect for burrs and nonuniformity; magnifies up to 100 times. Lamination shown is part of signal-generating microsyn, with extremely critical tolerances on spacing

Sensitive drill is used to remove material for balancing. Drill depth, taken from scale on balancing machine, is shown on indicator. Vacuum attachment on drill bushing removes chips as they are cut, thus preventing contamination of partially assembled component

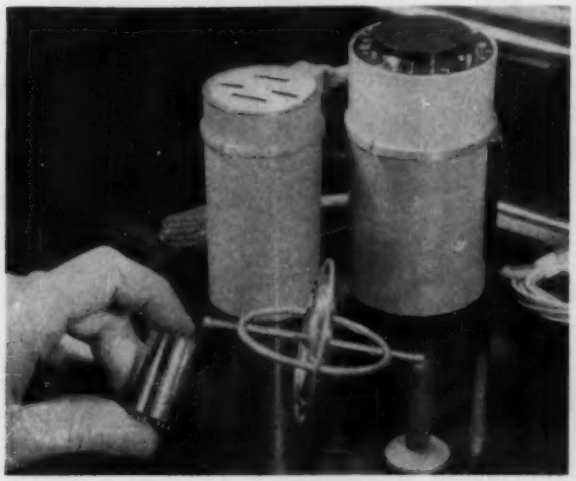
In an atmosphere antiseptically cleaner and more meticulously controlled for temperature and humidity than most hospital surgeries, technicians at Reeves Instrument Co assemble and test miniature nerve centers for supersonic missile and aircraft guidance systems. Techniques used to make these miniature gyros foretell the future for precision manufacturing

NORMAN R BLUMENSTOCK, senior project engineer

REEVES INSTRUMENT CO, a subsidiary of DYNAMICS CORP OF AMERICA, MINEOLA, LI, NY

High performance in supersonic navigational and weapons systems is made possible by using these miniature nerve centers, which operate on the same principle of equilibrium as the toy gyroscope. However, even slight traces of foreign matter in the sealed unit will result in tremendous losses of accuracy. More than $500,000 has been spent for this new laboratory

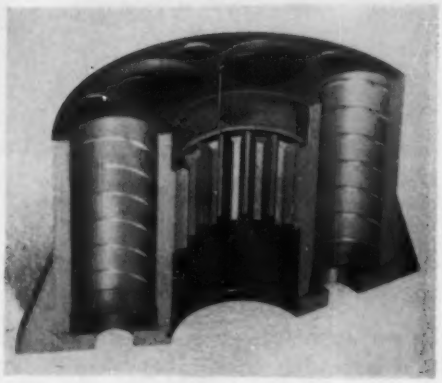
Leak testing is done electronically. Device shown will detect one part of helium in 300,000 parts of air at 0.2 micron pressure. Medicine seems even closer to mechanics when one realizes that, to absorb friction and protect the gyro from shocks and vibrations, rotating metal parts in these precise instruments are floated, hermetically sealed, in a highly viscous liquid. This setup tests the seal

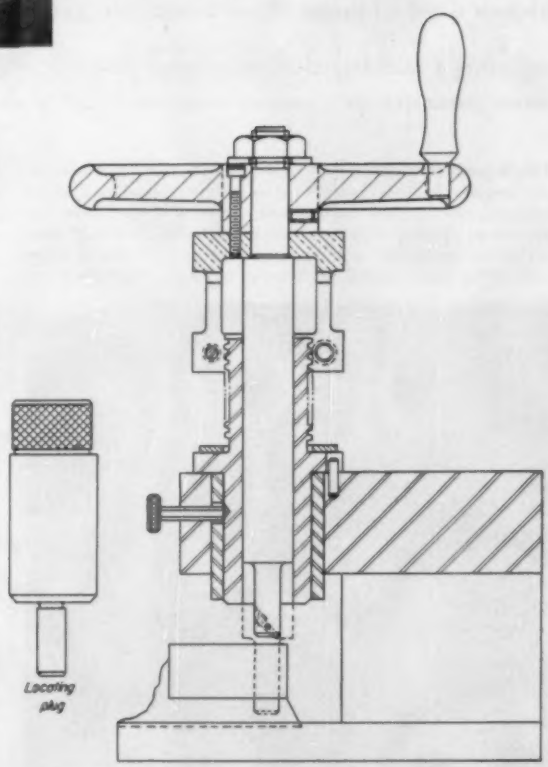


SHOP SHOTS

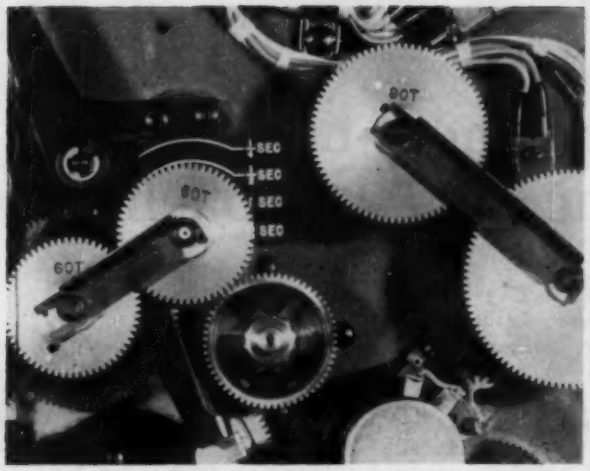
AT DACO INSTRUMENT CO BROOKLYN, N Y

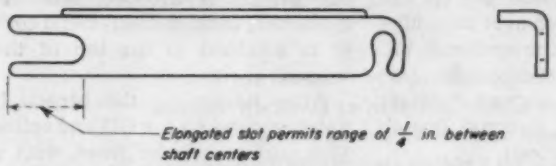
Grooving tool cuts a 5-P helical thread in the seven blind bores of a valve body within 10 min. Normally, this operation would be extremely time consuming if performed on conventional machines. Helical groove is 0.003 in. deep by 0.025 in. wide and is held concentric to the bore within 0.0002 in. TIR. No deburring operation is required on the grooves. Although the cylinder bore had a surface finish of 16 to 20 mu in. rms and the piston of from 2 to 4 mu in. rms, surface adhesion and galling between the two was still a major problem. Since the introduction of the helical groove, surface adhesion and galling is no longer a problem



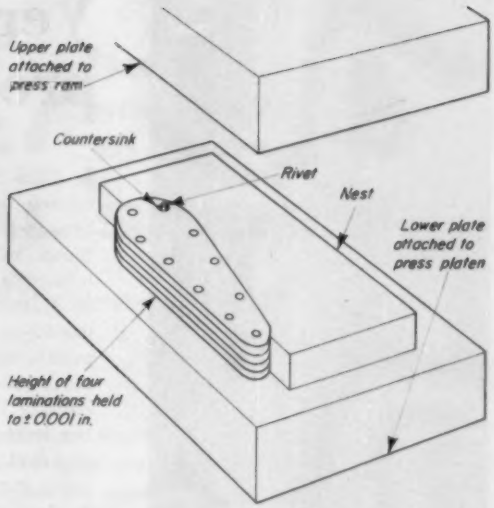


Boring Bar is removed between cuts and the locating plugs substituted in its place to align each bore of the valve body. Fixture base must be made heavy to overcome deflection resulting from clamping pressure. Carbide boring bit must be kept sharp and micro-finished to eliminate cutting burr. The boring bar requires a steady feed in order to obtain prolonged tool life

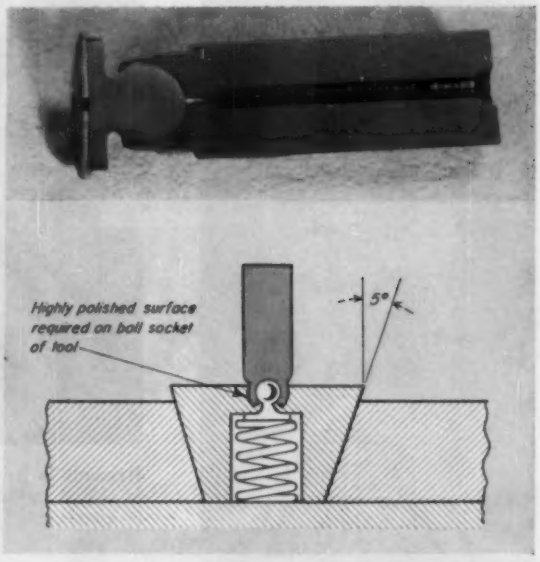




Retainer of unique design does the job of two conventional retainers and requires no special tools to assemble or disassemble from shafts. Other advantages are: unusual design permits ease of handling and assembly; less tendency to misplace or lose; one size allows a range of ¼ in. or more between shaft centers; and retainer can be coupled between shafts of different diameters providing the annular grooves on shaft ends are uniform


Upper plate attached to press ram
Countersink
Rivet
Nest
Lower plate attached to press platen
Height of four laminations held to ± 0.001 in.

Conventional 45T power press simultaneously peens ten rivets flush to top surface of a precision assembly made up from four laminations. This method of riveting proved ten times faster than normal riveting methods. Most power presses can be used to perform this operation because they are elastic enough to make up for any slight deviation in height of parts



Simple and efficient swaging tool uniformly flows tempered-piston-neck around ball socket while maintaining a maximum of 0.002-in. end play. Operation requiring 30 sec is performed in an arbor press using normal pressure, but must be accomplished in one stroke. Because the tool exerts equal pressure on circumference of piston neck the finished ball socket remains concentric to all diameters on piston assembly. Formerly spinning and a costly six-slide fixture was used to accomplish this operation, but both methods failed to meet required assembly specifications

Vertical heat-treat produces gear broach

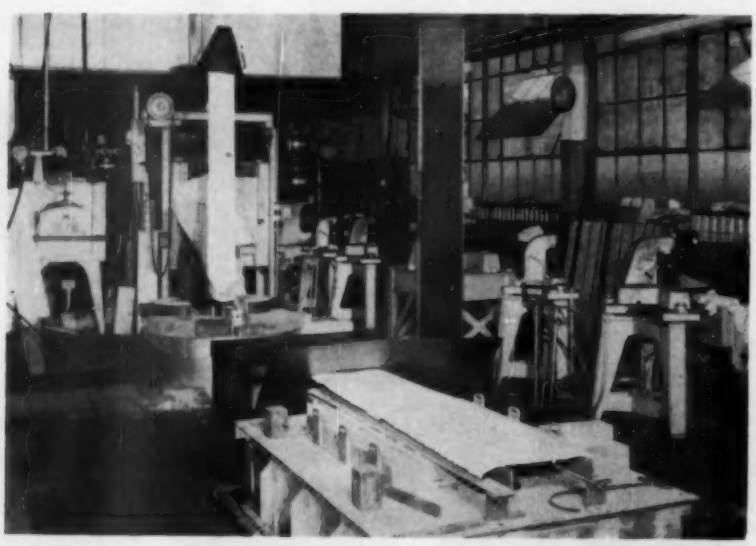
A 1025-lb HSS forging is being turned into one of the largest broaches in the world—to cut 44-tooth internal spur gears. The broach is 69 in. long and 9 3/16 in. in diameter, and is being held to 0.0002-in. accuracy on the involute profile and to 0.0005 in. on the tooth size, measured over pins. Machining is fairly conventional, but the heat-treat operations are carried out in new vertical floor-pit units installed at National Broach & Machine Co, Detroit.

The solid forging is first faced on both ends and turned on the OD, then through-drilled to produce a lengthwise 4-in. hole. Pilot diameters and threads are next cut at both ends to take puller and retriever fittings to be added later.

HANDLING FOR HEAT-TREAT

Special care is necessary during hardening, so the broach is handled vertically on a flanged bar carried by crane. To prevent chimney-heat effects from gushing oil upward as the broach is dropped into the quenching tank, a sheet-metal cover is attached to the top of the broach.

After hardening, the broach is finish-ground on the OD and spline at a surface grinder fitted with a large indexing plate that assures close spacing accuracy. The broach receives a Naloy surface treatment, then is ground to produce chipbreakers and face the teeth. Last operation is grinding threads for the puller and retriever details.



Broach is preheated . . .
in vertical furnace in foreground, then high-heated in background furnace. Quench tank is in middle

HSS broach . . .
will cut 5/7-pitch, 27½° internal involute spur gears with 44 teeth. Fitting at bottom is end of flanged support bar; at top is the crane hook

NINE WAYS TO CONTROL CAPITAL SPENDING

SPENCER A TUCKER, Management Consultant, LITTLE NECK, N Y

This article (another in a continuing series on Small-Plant Management) furnishes controls designed to help the man in management trigger short-term capital decisions. The nine controls described here do not cover the whole range of capital spending—9000 controls couldn't do that!—but they do supply the plant manager with ratios that will give him a clear picture of what's happening to his money

Regardless of how economical production is, or how effective sales are, adroit management of capital is needed to keep a company healthy—now and in the future. The various aspects of capital planning—short-range, intermediate, and long term—that are so important to successful operation must be integrated if the capital tool is to be handled efficiently.

If, for example, the company's ready-cash position is poor, it might not be able to meet payrolls or pay for raw materials, even though production is high, sales are excellent, and long-term capital planning has been successfully initiated. Whatever the reason for the lack of ready cash—failure to use available credit, an imbalance between sales and production efforts—it is clear that because one phase of capital has failed here, the whole company structure is weakened.

Managerial control of capital is a dovetailing and proportioning of production and sales efforts to the financial structure of the company, so that a decision in any one of these areas can be made with full awareness of its effect on the other two. Failure to integrate capital, sales, and production can cause many frustrations: inability to grow when expansion is needed; lack of funds for new-product development; inability to take advantage of lower-priced raw materials offered, or to replace tooling and machinery; and failure to meet that requirement with the shortest lead time and the highest obligation—the weekly payroll.

The velocity and acceleration of certain activities and their cycles are major criteria for sound financial stability. A manufacturing business (or any other, for that matter) deposits cash at the start of a cycle and expects to receive cash when the cycle ends. These questions arise here: How fast does the cycle occur? What returns does it bring? What risks are taken along the way? What degree of longevity does it produce?

These questions underlie a cash-to-cash cycle that can be likened to what occurs on a baseball diamond. The cycle is from home plate to home plate: The runner proceeds to first (the manufacturing cycle); then to second (the temporary-storage cycle); on to third (the sales cycle); and finally scores (the collection cycle). This analogy is not quite accurate, though, if one considers the "dwell" time at each of the bases; knowing this vital factor is essential to good capital financing.

Just as control ratios can be employed to evaluate and correct production and sales elements (*AM*—May 20 p153, July 1 p97, Aug 12 p117, '57), ratios can also be used to control financial matters. These ratios, made up of elements affecting capital, can be consulted at frequent intervals to show the state of the company's finances. If the data upon which they are based is accurate and up to date, they can furnish busy management with a barometer that will reveal at a glance any changes in financial pressure.

OBTAINING RATIO DATA

Information from the company's balance sheet and its profit-and-loss statement is the source for some ratio data. A few words of explanation are necessary here. Previous articles in this series have referred to the profit-and-loss statement, which differs from the balance sheet in this respect: The P & L

gives us the results of our operating efforts *for a given period*, considering only items of income and expense. The balance sheet, on the other hand, gives us the status or health of the business *at any instant*, comparing its assets and liabilities.

If your business were up for sale, an astute prospective buyer would not simply judge your company by its profit-and-loss statement. Even if the P & L showed a fantastic profit, it would not fully indicate how your business stands at the moment. Actually, your sales-collection policy may be sluggish, or accounts receivable dangerously high; these deficiencies, coupled with an unrealistic credit policy, may indicate that collection on sales is doubtful. Too, inventories may be high and cash low, or the company may be mortgaged up to the hilt—these conditions are not reflected in the P & L statement.

If, however, data from the P & L is related to data from the balance sheet, ratios can be developed that answer key questions on your financial structure:

I. Is my financing adequate?

The answer to this question can be found by studying the various cycles—manufacturing, storage, selling, and collection—that are connected with your company's business pattern.

From P & L			*Time*
Raw material:	$10,000		
Direct labor:	5,000	Manufacturing cycle:	10 days
Overhead:	10,000		
Finished goods:	$25,000	Storage and selling cycle:	30 days
From Balance Sheet:			
Accounts receivable:	$30,000	Collection cycle:	60 days

These cycle times are not laid end to end, of course. They are in a constant state of movement, but at different velocities. Consequently, a time overlap, always present, must be considered in computations of minimum financing needed to operate the business. The storage and selling cycle is three times as long as the manufacturing cycle, the collection cycle six times as long. But monies are received from a previous production cycle, according to the actual amount of accounts receivable. Thus one month's expenses for manufacturing must be backed by two months' expenses for both storage and selling (less manufacturing costs) and collection (less manufacturing and storage costs).

	1ST MONTH	2ND MONTH	TOTALS
Mfg Cycle	$25,000		$25,000
Storage & Selling Cycle	25,000	$25,000	50,000
Collection Cycle	25,000	25,000	50,000
		Total required:	$125,000

The minimum required to operate a business with the aforestated characteristics is thus $125,000. To operate below this minimum, collections would have to be accelerated.

II. What is my average collection period?

To find out how long your average collection period is, first find your accounts-receivable turnover per year, then divide this figure into 365 to get the average number of days required for collection of accounts receivable. If your sales are $1 million and your accounts receivable are $200,000, your accounts-receivable turnover is 5 times per year. Dividing 365 days by the turnover rate gives 73 days as your average collection period.

Your credits and collections department should be instructed to keep the ratio of sales to accounts receivable as high as possible, so that cash flow back to the company from collection of accounts receivable is steady. And the payment terms stated in your conditions of sale should be close to the average collection period.

III. How fast should my working capital turn over?

Working capital, and its turnover velocity, is a key item in the structure of a going business. Unfortunately, many small companies are under-capitalized, and with no other sources of capital available are forced to increase turnover velocity. A small company can operate on only 5% profit for each turnover of working capital, provided turnover is, say, 20 times a year. But if turnover is only 4 times a year, the company must make a 25% profit for each turnover to do as well. And when turnover velocity is reduced, overpricing and overstocking can be the disastrous results. Turnover is a function of the production, inventory, and collection cycles.

Working capital, which represents those assets that can easily be converted into operating capital, consists of current liabilities subtracted from current assets. To find out how many times a year your working capital turns over, simply divide this sum into your annual sales. If a company with annual sales of $1 million has current assets of $250,000 and current liabilities of $150,000, its working capital is $100,000 and the turnover is 10 times per year.

Serious financial problems can exist if this turnover velocity is either too fast *or* too slow; other ratios are needed to disclose what is going wrong. For example, turnover rate could be too fast if current liabilities are excessive because of untimely expansion or unrealistic stocking. It might be too slow if sales volume is low or inventory levels high.

Typical turnover velocity for metal-stamping shops is 5 or 6 times year. In foundries the rate will normally be a little higher. Machinery builders should turn over working capital 3 or 4 times a year.

Incidentally, in the above example the ratio between current assets and current liabilities (called the current ratio) is less than 2 to 1. Many people, overlooking deceptions inherent in this ratio, use it as an absolute guide. Where severe operational peaks and valleys are present, peak periods can show the ratio well below 2 to 1 and slack periods well above. The current ratio is also affected by the segment of the business in question, as well as traditional sales conditions. In general, this ratio measures the company's ability to pay its short-term debts.

IV. Is it worth my while to stay in business?

Many people still regard the percentage of profit on sales as the sole criterion for staying in business. They feel that a low profit percentage is not sufficient compensation for the risks they are taking. Here's where this concept is erroneous: The measure of return for ownership risks and efforts is in the relationship between profit dollars (which emanate from the P & L statement) and tangible net worth (which comes from the balance sheet and is the sum of preferred stock, common stock, and surplus less intangibles). What may be considered a low profit percentage on sales may actually represent a good and fair return on capital investment. A profit of only 2% on sales of $1 million may seem small. But if tangible net worth is $200,000 the return on capital is a respectable 10%. This latter percentage is a much more reliable gage of whether the business you are in is the best place for your money to work for you.

V. How fast is my inventory turnover?

A vital statistic for financial control, velocity of inventory turnover is obtained by dividing the inventory at cost into the cost of goods sold. A turnover of 6 or 7 times per year is a reasonable goal for the metalworking industries. This control reports on excessive buying and devaluing of inventories, as well as sales activity and the economy of the production effort. Too low a turnover might indicate that inventory speculating took place, in anticipation of a rising price market, so that too much working capital has been tied up in excessive inventory. Obviously, such practices can lead the company into a dangerously marginal position. A rule of thumb is that all working capital should rarely be carried in inventory, even if obtainable at a bargain price.

VI. How much of my business should be tied up in fixed assets?

Have you ever thought about this one: What percentage of what the business is worth should be tied up in fixed assets? To find out, divide tangible net worth into the value of these assets (allowing for depreciation, of course). The smaller the percentage, the easier expansion should be; the larger it is, the tougher. And if the figure is around 70% now, chances are that you are having trouble meeting your bills, because of an unjustified expansion that crippled your working-capital position and sent you to the bank.

VII. What is my productivity in terms of sales?

If turnover of tangible net worth is related to sales, the company's productivity in terms of sales can be measured. This ratio is obtained by dividing tangible net worth into sales.

Here, as in the turnover of working capital, the goal is not necessarily a maximum, but rather an optimum, considering the characteristics of the particular business. A higher-than-optimum ratio may indicate that the company is "overtrading," that is, sales are too high for the capital invested, so that the company has to obtain wider credit, thereby raising the ratio of debts to investment. Besides placing creditors in a marginal position, the company may find that it cannot meet its obligations.

To offset this risk, the company may invest more of its own capital; therefore, the next check is to see whether the return on the second segment of invested capital is at the same rate as the first—or higher. In other words, management should ascertain whether the expansion into higher sales is economical or just a romantic excursion.

Of course, ostensible "overtrading" may be the healthy result of higher productivity. This condition can be confirmed through the use of control ratios developed in previous articles in this series: billings per square foot, payroll dollars per square foot, departmental and over-all productivity and performance, etc. But don't expect a linear correlation here between former productivity and increased productivity, because some production expenses change and some do not as sales increase.

VIII. How can stored, finished goods and accounts receivable be quickly converted into cash?

Most industrial financial troubles stem from a lack of funds at a critical time—perhaps not critical enough to affect the meeting of a payroll, but so critical that the company must live hand-to-mouth with creditors. Obviously, the company can liquidate assets to meet such a demand, but this procedure is almost always impractical. The most obvious thing to do is to examine two situations closest to the cash stage:

1. The sales-dollar value of finished goods awaiting release authority
2. The amount and age of accounts receivable

The question naturally arises: How can the first be converted into accounts receivable and the second into cash? Here's how it was done at one company, which produces small machine parts on a job-shop basis, with an annual sales volume of $1 million. This company had a sales value of $200,000 tied up in finished goods.

Both management and the sales department did not evaluate the releases from their customers very closely, and as a consequence the inventory of finished goods consisted of many orders, of varying dollar values, that had remained on the manufacturer's premises for different time intervals. Because of accrued expenses for extended storage, a good percentage of the sales price for each order was being depreciated constantly, and the company's cash position was seriously affected by the extent of the inventory tie-up in these finished goods. Management's laxity had caused company space to be used as a warehouse for customers.

What was needed was additional stimulus for salesmen, who might in addition to their usual duties keep in more frequent contact with their customers and take active interest in the state of the goods they sold. A financial incentive was installed, as follows: Each order of finished goods was assigned its proper sales value, as well as a

time factor based on the length of time each finished order remained in the plant. Then each order was converted into "dollar months," as in the following example:

FINISHED GOODS IN STORAGE SOLD BY JOHN JONES

Sales value of his orders	No. of months in storage	"Dollar Months"
$10,000	4	40,000
35,000	2	70,000
22,000	10	220,000
16,000	6	96,000
	Total:	426,000

This total figure gave some idea of the salesman's ability to police customers' accounts and, incidentally, became another factor in management's control of sales. Because the company was anxious to obtain cash for this stored inventory as quickly as possible, it installed a temporary incentive plan, used only as an expedient, which related the sales value of the releases to the time it took to obtain the releases, as follows:

Time to Obtain Release	Sales Value, Added Commissions Earned			
	Up to $10,000	$10,000 to $40,000	$40,000 to $100,000	Above $100,000
½ month	0.35%	0.39%	0.43%	0.47%
1 month	0.3	0.33	0.37	0.41
2 months	0.22	0.24	0.26	0.29
3 months	0.14	0.15	0.17	0.19
4 months	0.05	0.06	0.07	0.08

Note: The basic sales commission paid averaged 4% and varied with the age of account sold, i.e., new accounts received higher rates than old accounts.

The above plan stimulated salesmen to obtain shipping releases as fast as possible for the largest amount possible. The result was that in 8 weeks the finished-goods inventory had decreased from $200,000 to $60,000, increasing accounts receivable by $140,000. Although this latter figure was only a paper one, the company's collection experiences were satisfactory, and soon the company had the needed funds at its disposal.

After the goal was accomplished, the plan was removed and proper financial and sales controls were established, so that sales practices were related to the company's financial demands. The plan also helped the company in another way: It provided objective data on storage costs, so that if a customer requested that the company store his order for a certain time before shipping, realistic charges for storage could be added to the original invoice.

Some companies, attempting to speed collections, have increased their discount terms to customers after the sale has been made. This procedure indicates financial distress and makes negative impressions on customers. It should only be followed with well-established customers, where there is close personal contact.

IX. How can I police my finished-goods inventory?

A turnover control may be used to police finished-goods inventory. This ratio is obtained by dividing the value of finished goods held in inventory into the cost of goods sold. In the previous example, the company was convinced that it could operate successfully on a finished-goods inventory having a sales value of $60,000, and accordingly set up a standard of 17 for this control ($1,000,000 ÷ $60,000). As soon as this index dropped appreciably management started trouble-shooting.

MAKING THE CONTROLS WORK

Capital is, as everyone in management knows, an immensely complicated subject. The purpose of this article has been to give to small-plant management a set of tangible, realistic controls that can be used to check a company's immediate financial health. To put the controls into effect, the following system might be used: Go back to periods during which you had certain financial difficulties and apply the ratios given above. Do the same for periods of financial bliss. Learn why the ratios changed and what caused the changes. Then, if it is possible for you to adjust the figures to take into account transiencies in the subject years, you will have a yardstick that can be used as further guide to current finances.

In plant operations, which are always in a constant state of change, tools more functional than the P & L statement should be used. As mentioned previously, data from both the P & L and the balance sheet should be integrated. The difference between the two is analogous to evaluating the performance of a track athlete. In the P & L sense, performance is obtained by dividing linear distance into time to get yards per second. We can use production-control ratios to analyze peaks and valleys of the operating performance, which is analogous to motion pictures taken of the entire action and then analyzed to show the characteristics of spurts and slowdowns, and their relation to track terrain, all the while having previous data as confirming information.

In a balance sheet, on the other hand, certain static data appears which cannot be changed except by major capital changes in a company's structure. Thus our track athlete's balance sheet would be the taking of his age, weight, height, blood pressure, respiration, and metabolism before and after the action. This can be likened to a statement of company health at any one instant.

Company growth—either physical expansion or increased sales—does not necessarily result in linear movement of individual assets, liabilities, income, expenses, or ratios composed of these elements. Because decisions on capital matters must be made in advance, and because movement of various operational cycles is relative rather than linear, it is impossible to pinpoint with complete accuracy the path that will evolve from an initial step into the confusing area we call capital. But with a few easily manipulated controls, the busy plant manager can keep his finger on troubles as they develop, and can supervise his proposed capital program efficiently.

DETROIT RE-AUTOMATES FOR '58 PRODUCTION—3

This third article in our current series on automotive retooling for the new models includes three features. One covers Chrysler's big new Twinsburg, Ohio, stamping plant where 3500 employees and the latest in press automation, materials handling, and layout efficiency turn out 45,000 tons of sheet metal per month as auto-body panels. These big parts are supplied for assembly plants in Indiana, Michigan, and California.

The second feature is on Buick's new Dynaflow transmission, which has infinitely variable vane pitch and includes a number of new parts. The most interesting of the new tools and equipment for the transmission are the transfer lines for machining the case and rear-bearing retainer, both of which are permanent-mold aluminum castings instead of steel.

The third feature covers Pontiac's crankshaft line, where carbide tools are being applied for the first time because machines with power and speed enough to operate them are available.

New plant, new presses stamp Chrysler bodies

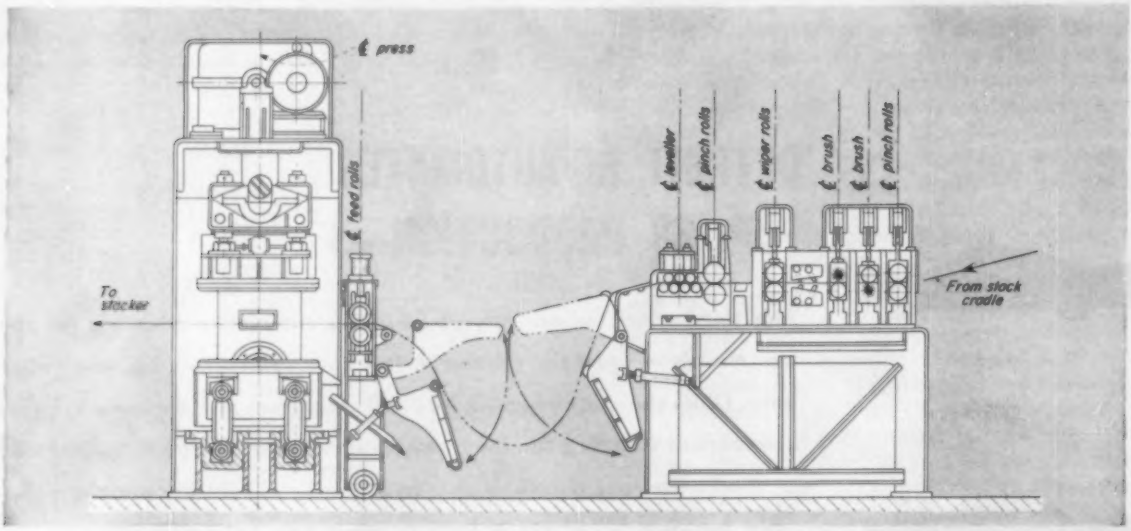
GEORGE H DE GROAT, Detroit editor

The $85-million stamping facility at Twinsburg, O, is one of three major projects authorized by Chrysler Corp under a 1957 expansion and improvement program. The plant covers 34 acres, and it produces roof panels, rear-quarter panels, door panels, deck lids, floor pans, hoods, fenders, and other smaller body parts at a rate of 1200 ton/day.

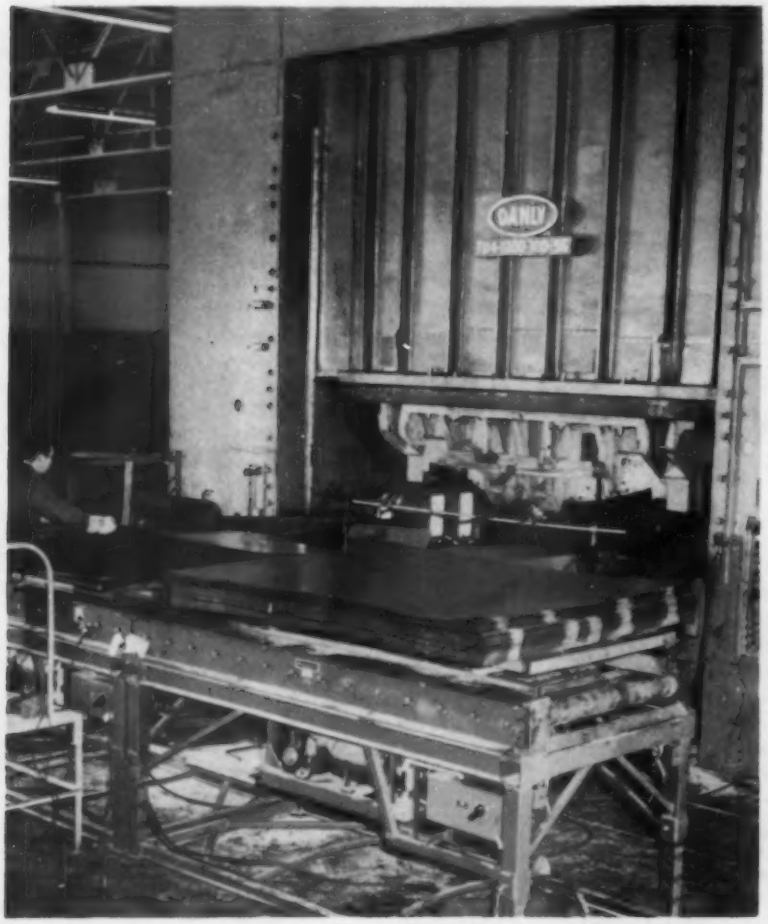
New construction ideas in the buildings include important fire-prevention elements, one of which is non-flammable Koroseal vapor barriers over metal roof decks. Roofs also include smoke vents operated by heat-sensitive linkages. (One of the major problems in GM's Livonia fire in '54 was dense smoke, which made fire fighting difficult and dangerous). In addition, corrugated sheet-metal fire curtains extend from lower chords of building trusses to the roofs to divide the upper portions of the buildings into separate areas.

TEXT CONTINUED ON PAGE 131

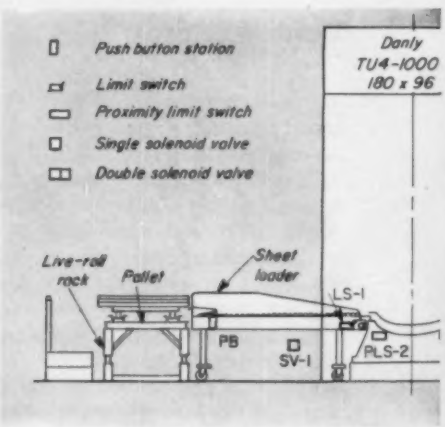
New plant, new presses stamp Chrysler bodies . . .



Continuous stamping produces auto-body panels in Wean 300-ton "flying press." Stock is 72 in. wide and 0.020 to 0.078 in. thick, and is fed continuously from unreeler through brushes and leveller. Upper press die moves in a circle; lower die moves in a reciprocating circular arc, and they meet at stock level when both are travelling at their maximum speed forward. Rolls feed the stock rapidly, but release it as the dies come together. Hinged stock supports between the leveller and the press loop the stock to compensate for minor speed difference between rolls and dies. This press and a similar 125-ton unit that produces 400-500 pc/hr have no brakes or clutches, and have pressure-lubricated bearings



Roof-panel line has three 1000-ton Danly presses in automatic lineup, though first press is fed manually. Stacked sheets 72 x 91 in. are brought from blanking press to line roll rack, then placed on sheet loader for transfer into die. Triple-action press then draws blanks at 10 spm. This line is one of five similar lines for large body panels

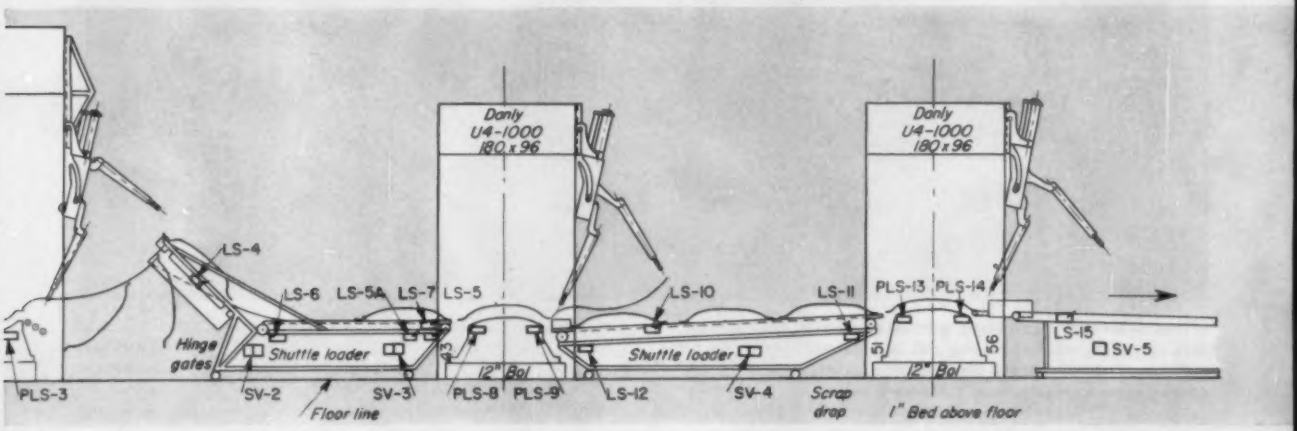


Sahlin "iron hand" unloads first die and places drawn sheet in turnover gate that reverses panels so they are convex side up. Shuttle loader picks up panel and places it into second die, which does restrike operation. Solenoids, conventional limit switches, and proximity limit switches are actuated here and throughout the line to control cycling and make sure all elements in the line function properly

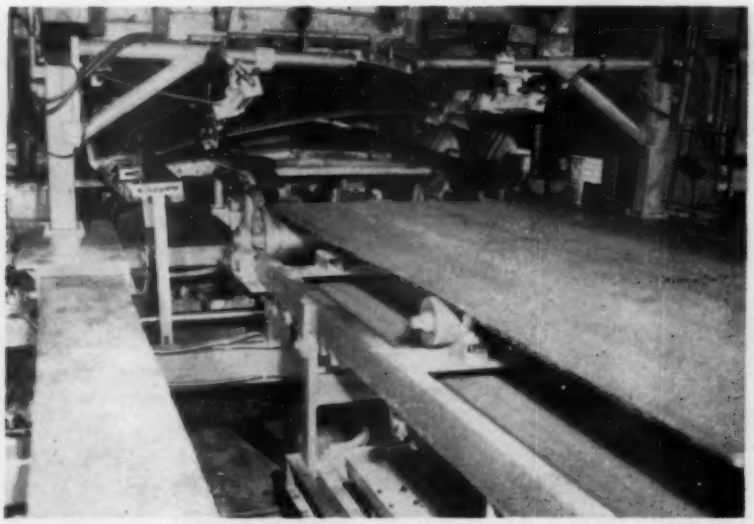
Shuttle loader places roof panel into third press for trimming. Chain-drive transfer dogs move the panels along alignment rails which are adjusted for height by hydraulic jacks

Another carefully engineered element in the plant is the scrap-handling setup. A main double-chain apron conveyor 54 in. wide and 1500 ft long is fed loose scrap from the presses by 28 similar collecting conveyors 24 in. wide and 140 ft long. The system can handle 55 tons of scrap per day, and dumps it into two balers; one that operates normally and one for standby. If one baler is down the three-way chute at the end of the main scrap conveyor shifts scrap to the other. A chute from the baler house delivers baled scrap to railroad cars. Limit switches control the height of the chute, and are tied in with a railroad-track derailer that prevents car switching when the chute is down.

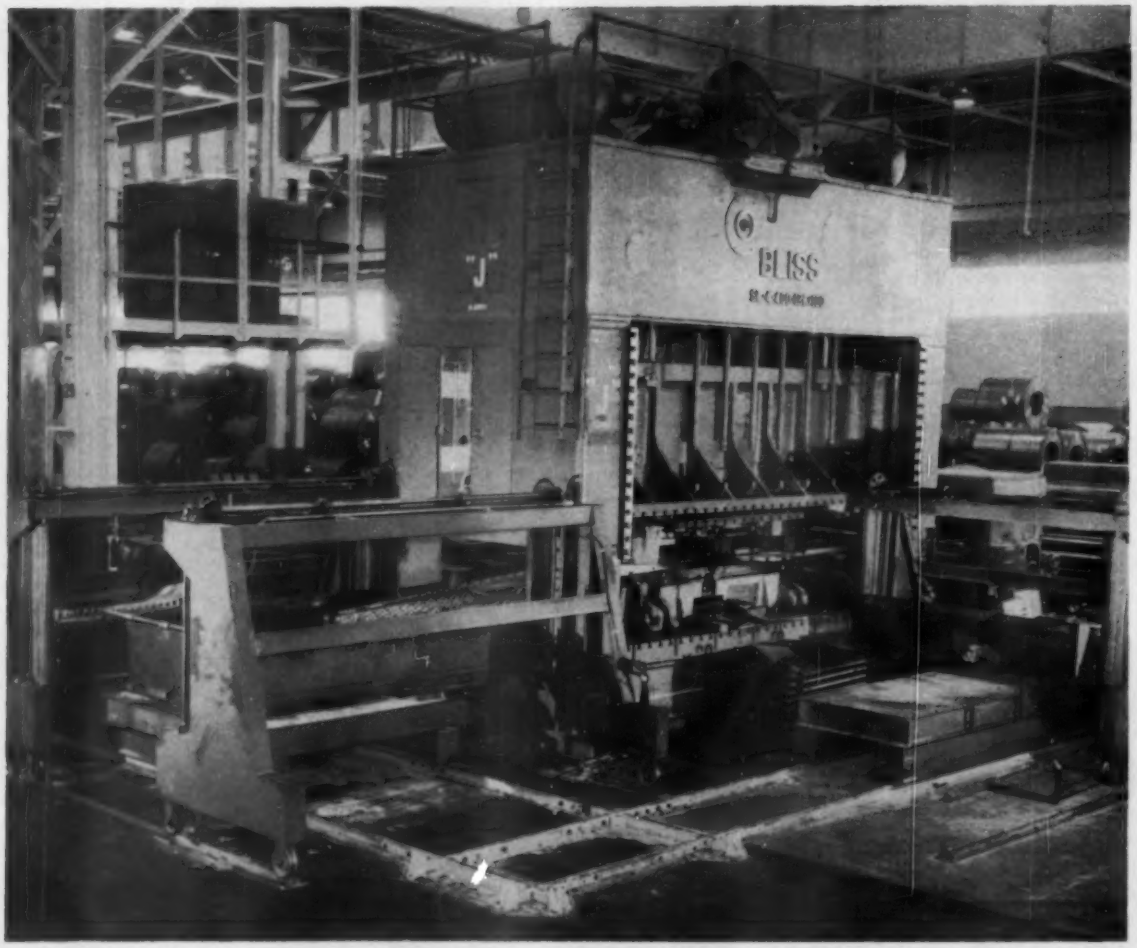
Production ideas incorporated in the plant, as illustrated on these and following pages, cover continuous stamping, mechanized parts handling, and automatic assembly of sheet-metal parts . . .



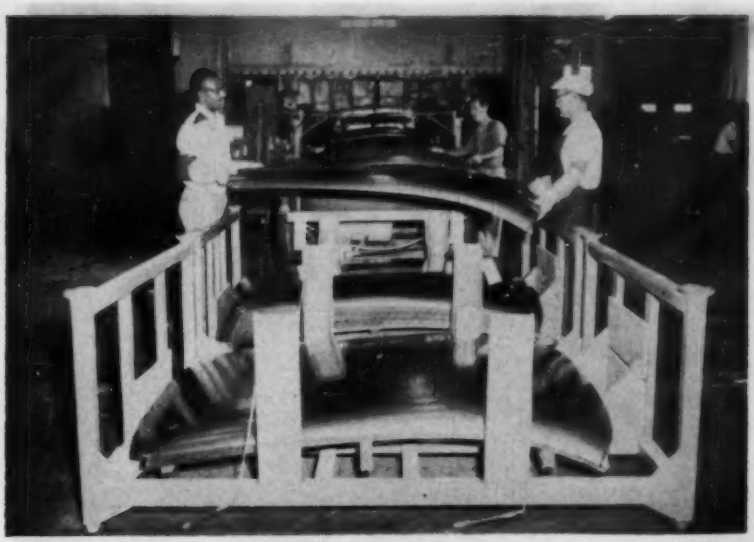
New plant, new presses stamp Chrysler bodies . . .



Hydraulic Extractor at third press is a special G & W dual side-arm unit that grips the light panel at both sides to prevent damage. Extractor jaws move 84 in. to pull work straight out and lower it to fabric conveyor belt for transfer to other operations

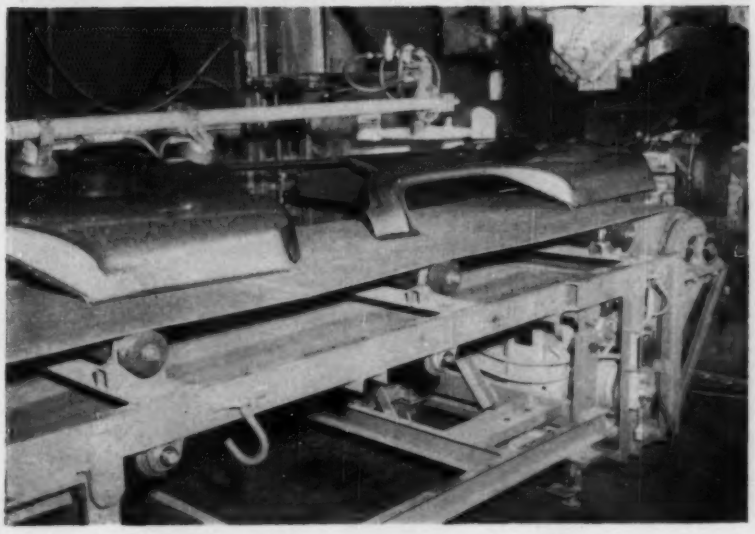


Bliss 400-ton blanking press receives stock from a McKay cradle, washer, flexing roll, straightening roll, and feed roll (rear). It discharges blanked parts down a roller conveyor to one of two transfer cars that carry pallet lifters. When one car has a full load, both cars are powered along the floor rails to bring the second car under the conveyor to receive blanks, leaving the first car in a free area where a fork truck can pick up the pallet lifter for delivery to a press line. Car transfer takes 25 sec, and insures that blanks can be unloaded continuously. When second car is full, cars are powered back again



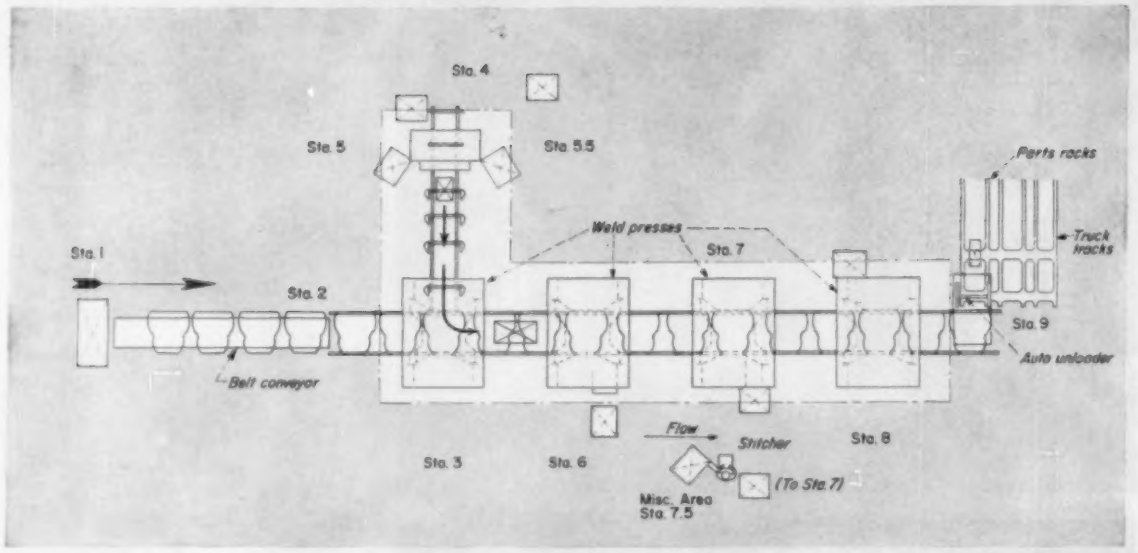
Panel inspection is combined with manual pallet loading at end of line. Fork trucks move panel pallets to another area where fiberglass pads are installed.

90° turnover puts newly drawn quarter panels in lengthwise direction for press operations. Automatic blanking-press extractor has two jaws, but one releases when part is free to pivot. When part has turned, second jaw releases panel

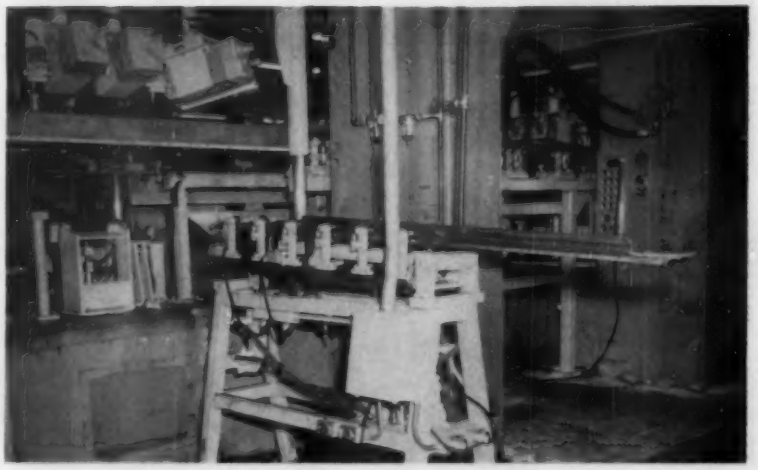


Suction-cup extractor on portable conveyor section removes quarter panel from die. Irregular part slides along bar as it moves to next press—the bar keeps it in line and prevents tilting

New plant, new presses stamp Chrysler bodies . . .



Floor pans are automatically assembled in four Danly welding presses. Pans are manually loaded onto belt conveyor and carried into first press. Subassemblies are joined and welded together on short lines feeding into the second, third, and fourth presses down the line. At last press welded pans are ejected onto stacking device



Shuttle feeders bring in small components to welding presses automatically. Spare-wheel anchor rod, fuel-tank filler tube, and underbody reinforcement are added to floor pan this way

Cast aluminum transmission cases . . . now have integral hydraulic servo circuits, here going through Heald transfer machine. Milling cutter will come down to surface case tops as cases feed along

Transfer lines build BUICK'S new Dynaflow

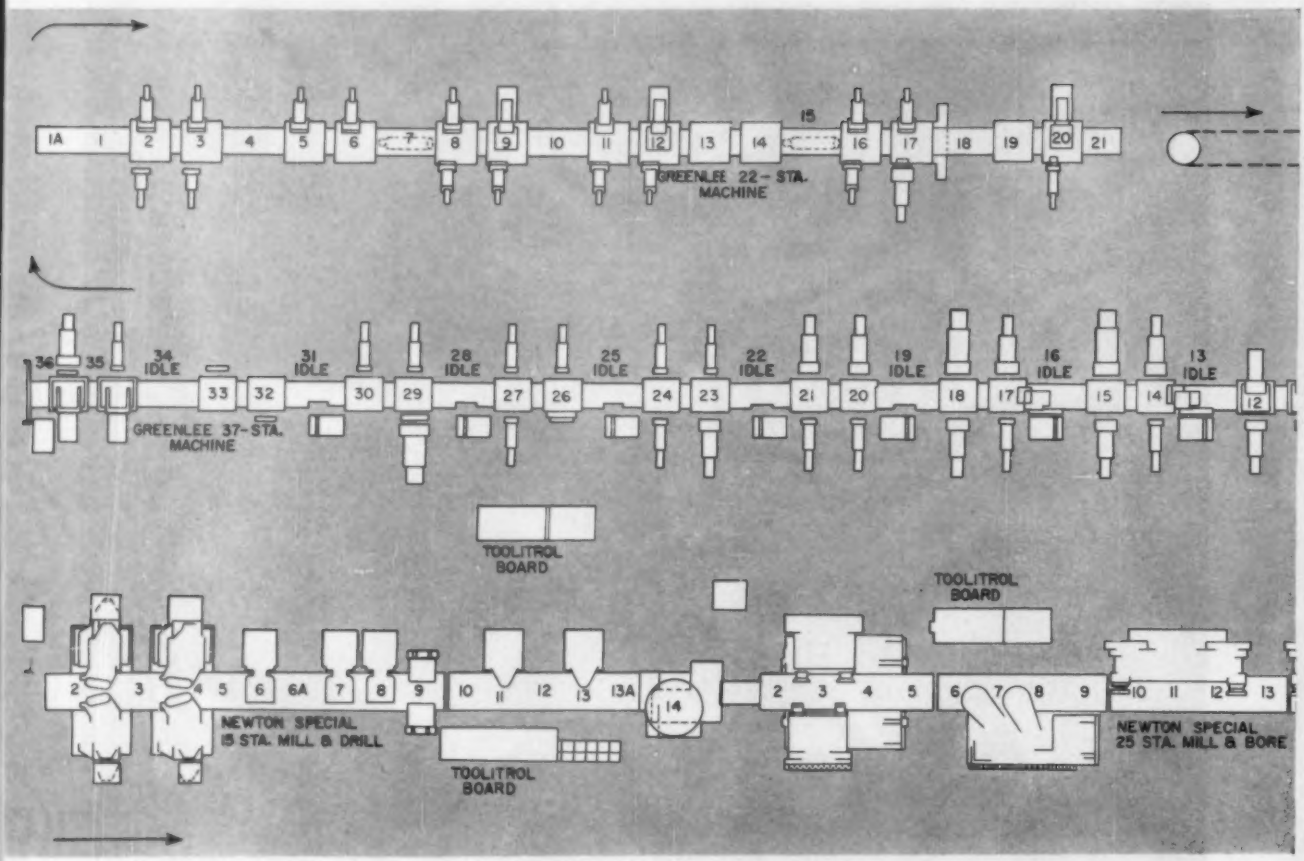
One of the major improvements in the '58 Buick is a redesigned Dynaflow transmission, which incorporates infinitely variable vane pitch. This feature is controlled by the accelerator pedal, acting through a mechanical linkage to a hydraulic valve in the transmission. The unit has a number of new components, including a stator, and it has plate clutches instead of conventional cone types.

The redesigned transmission demanded new tooling ideas, among the most interesting of which are those shown on these pages. One interesting setup not pictured is a transfer gaging unit that inspects 19 dimensions on transmission cases. It works much like a machining transfer unit, picking up a case from an idle station on a CentriSpray walking-beam washer and placing it in an idle station next to a Sheffield gage. The mechanism indexes the case to the gaging station, locating the work with its bore axis in the horizontal plane and at right angles to the direction of travel of the transfer rack. The servo body is face up.

Spindle slides bring in "Plunjet" and open-jet spindles connected to variation, differential, and "Airlectric" heads, which indicate concentricity and squareness as the spindle rotates.

Base, slide units, and holding fixtures of the inspection device are the same as used in the Heald machining equipment that does the final boring, so locating and clamp-

Transfer lines build BUICK's new Dynaflow . . .



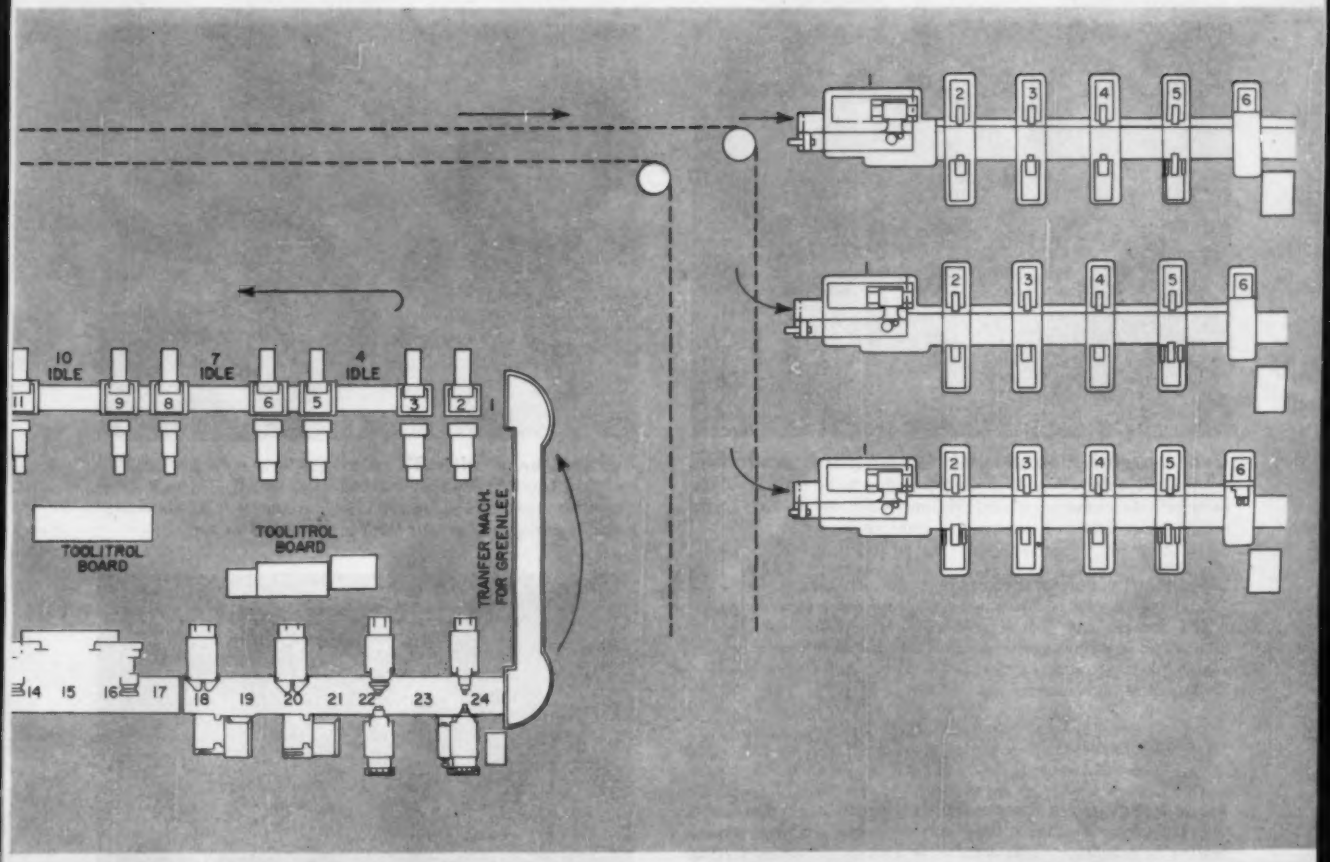
Dynaflow transmission cases are machined . . . on seven transfer units in this S-shaped line. First element is a 15-station Newton that mills and drills four cast lugs (and reams two holes for hardened bushings). Second machine is a 25-station Newton that rough-mills the pan face and rough-faces and bores both ends. After the first S-turn, a 37-station Greenlee drill-reams, chamfers, and taps holes; and a 22-station Greenlee does more of the same on the last leg of the S. Parts go through a CentriSpray jet washer and split up to go through three Heald machines that semi-finish and finish the bores and faces. This layout has electrical and hydraulic machine-control cabinets raised 9 ft above the floor to save space—a central panel normally controls the whole line. Under-floor chip conveyors and a Hoffman central coolant system serve the layout

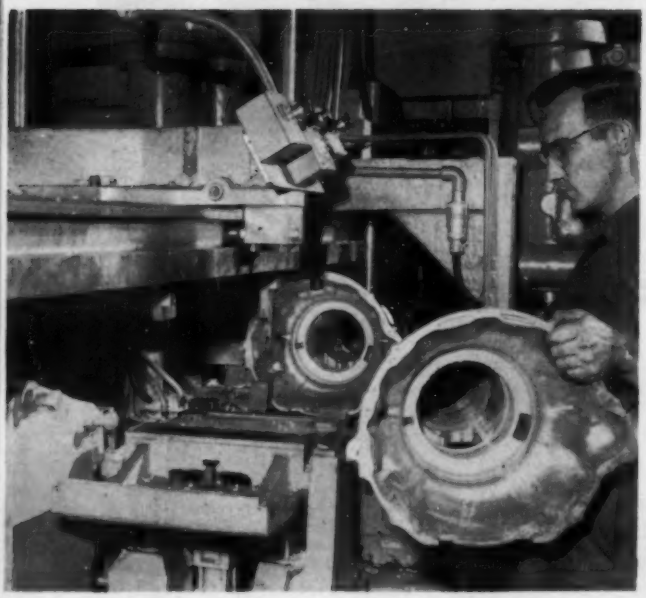
ing actions are identical for boring and gaging, and maintenance is simplified.

After gaging, the machine transfers the part to an idle station and repeats on the next part. If a number of successive rejects occur, the machine stops itself. Rejects are indicated by the letter "A", stamped by the machine on a lug at the small-flange end of the case. When the machine stops because of excessive rejects, all gaging elements are left in position so the condition of the part will be indicated by tolerance lights on the panel. Barring rejects, cases go on to high and low pressure tests and final inspection.

"BROACH-PULLER" CLAMPING

Another novel setup is at Michigan Tool gear hobbers, where gear blanks for the transmission pump (this setup is illustrated) are clamped two at a time hydraulically. Blanks are loaded on a split expanding sleeve operated by sliders that move with the headstock and tailstock. The sleeve is expanded 0.008 in. on the dia to hold the blanks firmly on their ID's with their ground faces against stop rings. The "puller" is an integral member connected to the slider and engaged in an internal collet in the headstock so the closing action of the hobber pulls the tailstock slider into the sleeve and into close engagement with the headstock slider. Opening the machine permits the inner collet to advance enough to release the puller, freeing the slider and removing pressure on the split outer sleeve. Variations of this tool are used for flat gears and those with counterbored or bossed faces.

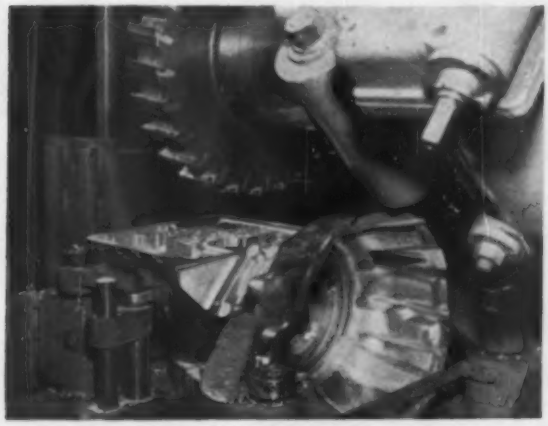




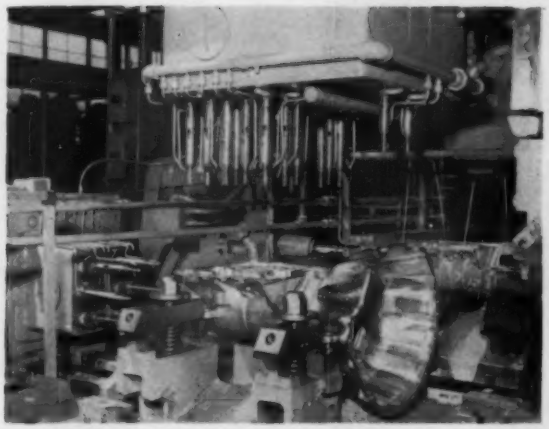
Manual loading starts cases through . . . transfer lines. Both transmission cases and rear bearing retainers (see following pages) are permanent-mold aluminum-alloy castings that require less stock removal than steel. This makes machining easier and faster and reduces tool wear. In addition, servo circuit (top of cases in photo at right) can be integrally cast; need not be bolted on

Bore-reaming is done . . . on three Heald lines. Tool is carbide, and feeds axially out of spindle that also carries rotating carbide bushing which requires less clearance than stationary bushing. Thus, concentricity is close and reamer wear is low. Reamer cuts only at outer edge and has straight action like single-point tool. Coolant for finish-boring is refrigerated to 70-72 F

Transfer lines build BUICK's new Dynaflow . . .

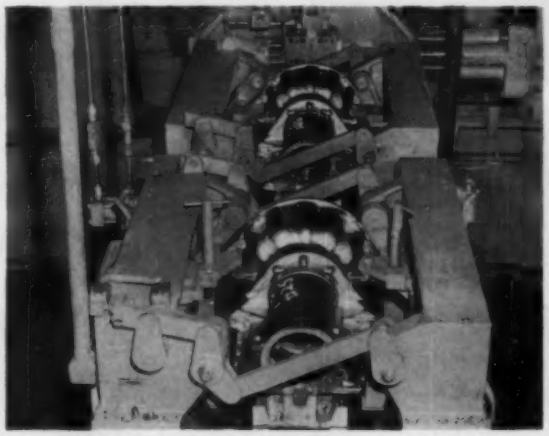


Rear engine-mount pad is roughed and finished . . . by 17-in. Wesson inserted-carbide tools that cut with both face and periphery. Milling heads are at 48° angle, roughing at 1500 and finishing at 3000 sfpm

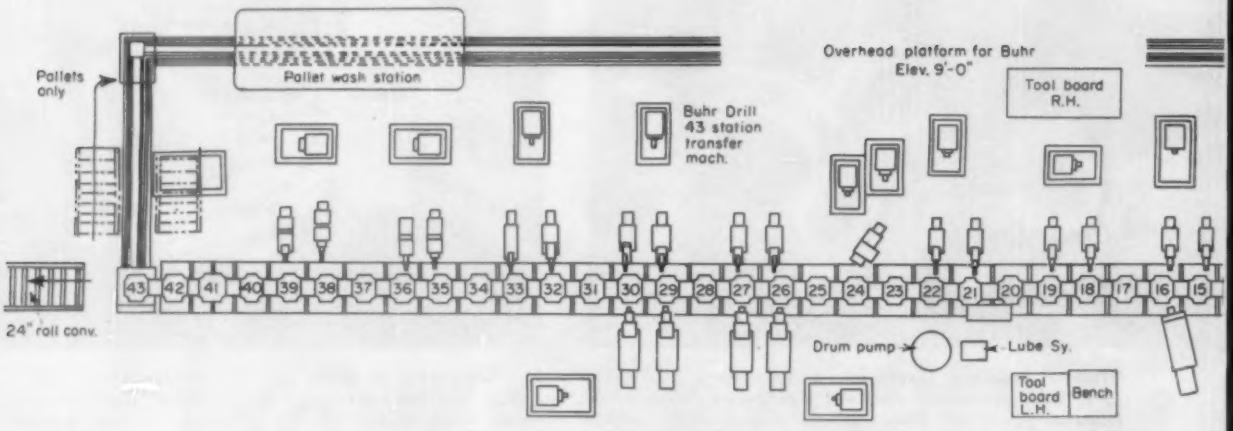


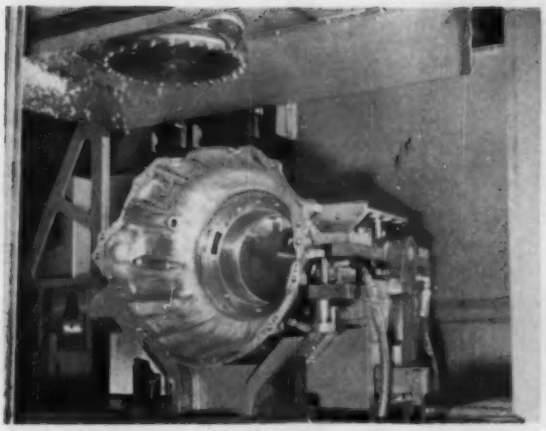
Vertical head with 27 spindles . . . taps all holes in case pan face at same time six horizontal spindles do final drilling on case end. Greenlee machine is constructed on "building-block" principle, as are all other machines in the line

22-station Greenlee carries cases on conveyor . . . not on pallets. Parts are transferred from previous machine by Allied "cross-travel" conveyor that rotates them 180° in the vertical plane to place the pan face down, and 90° in the horizontal plane to present the bell-housing end first. Machine drills, reams, and chamfers

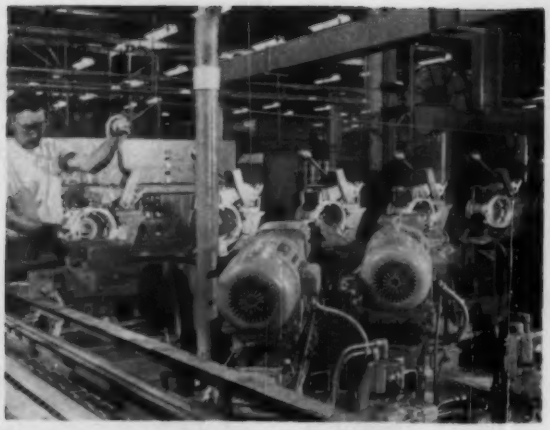


Rear bearing retainers are drilled . . . chamfered, and and tapped in 43-station Buhr transfer machine. One special feature is telephone jacks located in control panels and wing bases throughout the unit to allow conversation between tool setters and maintenance men. Parts move on special pallets indexed by a transfer bar and located at each station by a shot pin. All holes are probed, and signal lights indicate errors. Each spindle has Alemite mist lubrication, and all other operating parts are lubricated by a central Lincoln system


Pallets only
Pallet wash station
Buhr Drill 43 station transfer mach.
Overhead platform for Buhr Elev. 9'-0"
Tool board R.H.
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15
24" roll conv.
Drum pump
Lube Sy.
Tool board L.H.
Bench

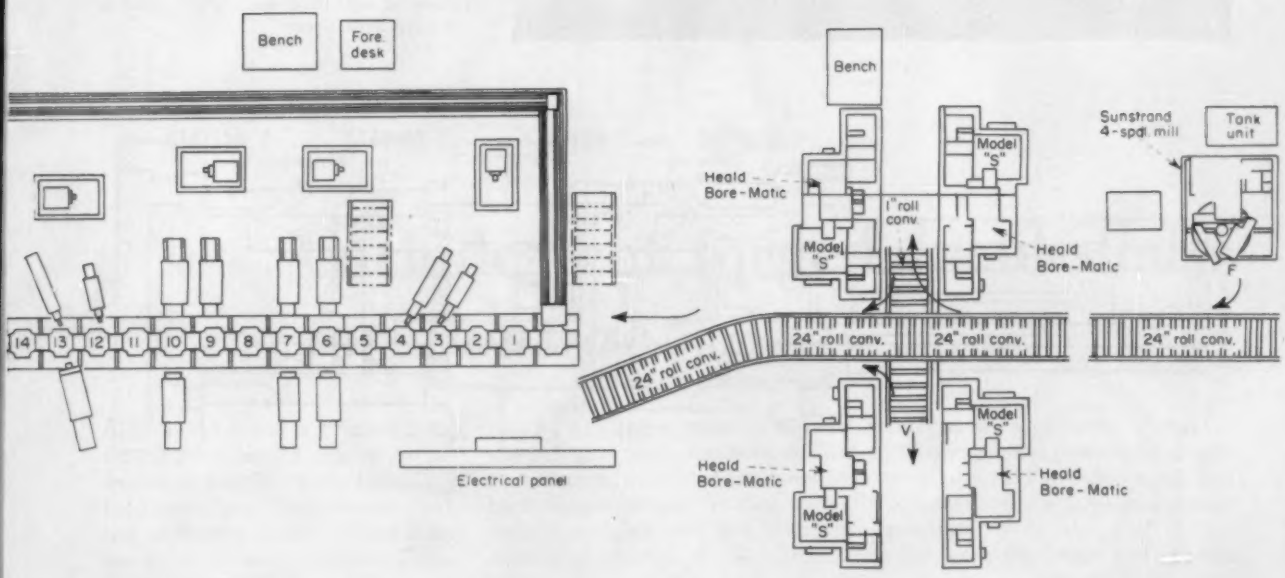


Pan faces are finish-milled . . . in three parallel Heald machines that bring down 24-tooth inserted-carbide cutter as the case travels horizontally. Coolant is also refrigerated here to increase tool life, cutting accuracy, and efficiency

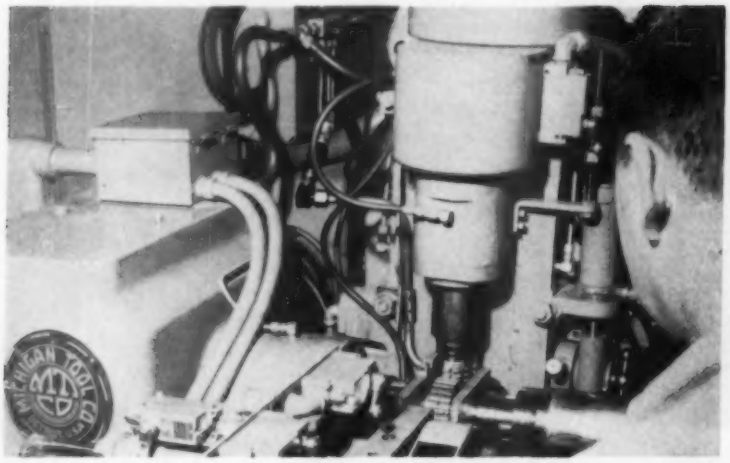


Retainers are loaded and clamped . . . into pallets manually at Buhr machine. Flange ends are manually burred at a bench before retainers are loaded. Overhead conveyor at the end carries retainers to a group of Heald Borematics for finish boring, turning, facing, and chamfering on both ends, after which the retainers are washed, inspected under high and low pressures, rewashed, and finally inspected. Empty pallets return to loading position, passing through a built-in washer en route

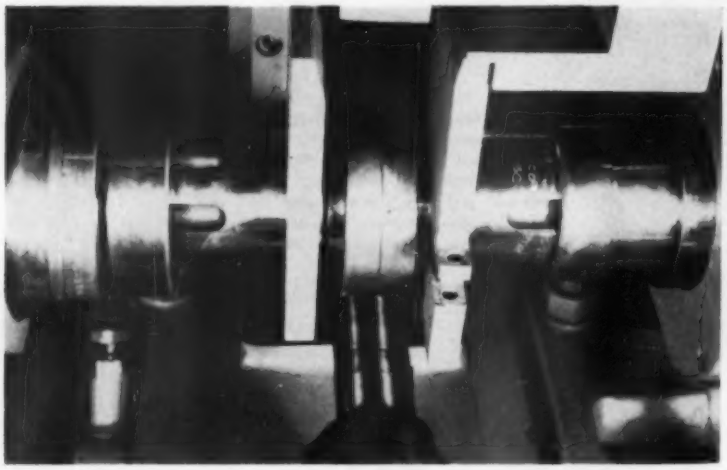
Reverse-clutch backing plates are assembled . . . to transmission cases in 10-station Crescent machine. Four holes are drilled into backing plates to take hopper-fed dowels that are automatically assembled. Machine has rectangular closed circuit, and brings back pallet and work fully assembled for manual unloading and transfer to overhead conveyor that carries the work to a pressure-test area

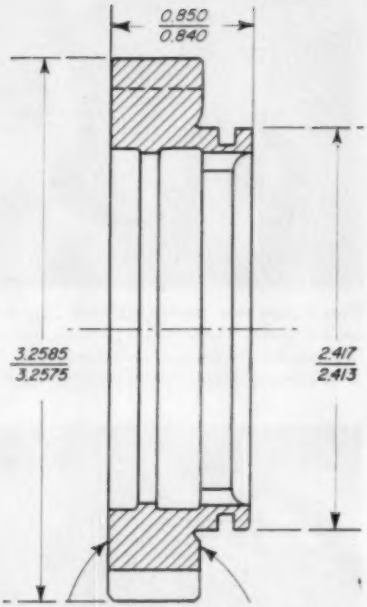


Transfer lines build BUICK's new Dynaflow . . .

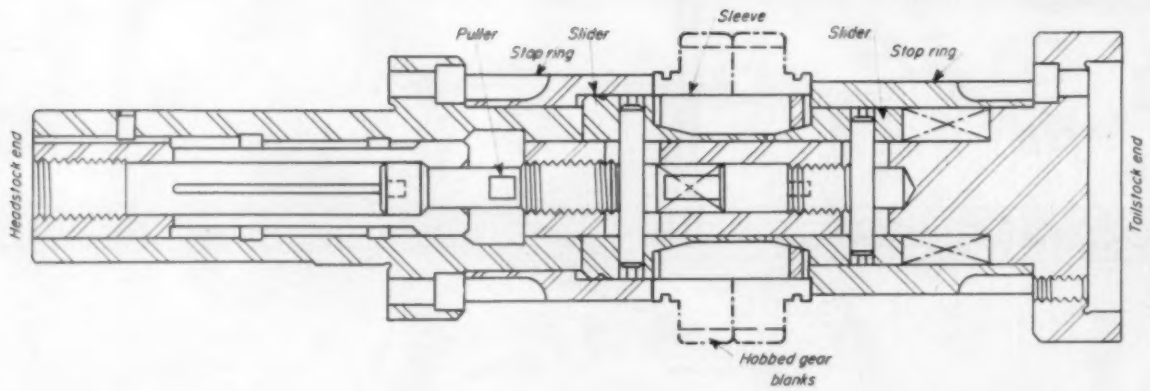


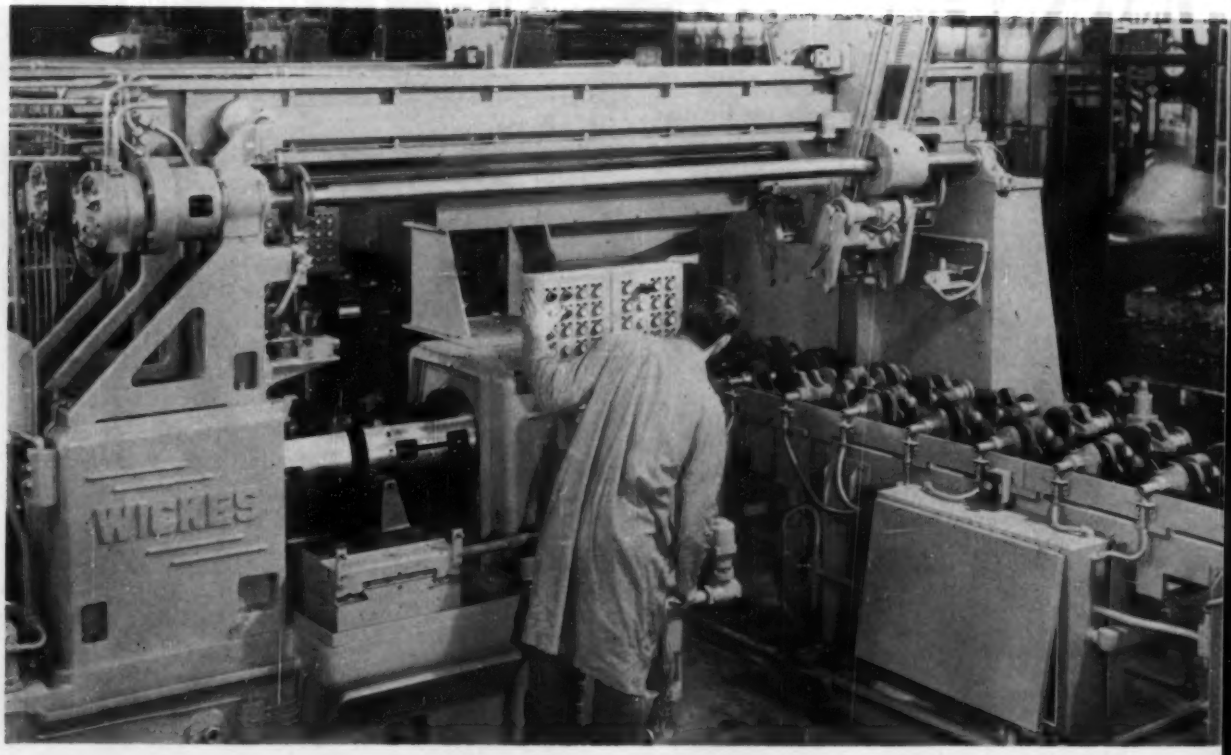
Special arbors hold two large-bore driving gears . . . for transmission pumps for hobbing and shaving. Blanks are centralized on ID's only and located by previously ground sides. Machine has hydraulic clamping for power without strain on machine members. Accurate holding is most essential for accuracy on parallelism, concentricity, and squareness

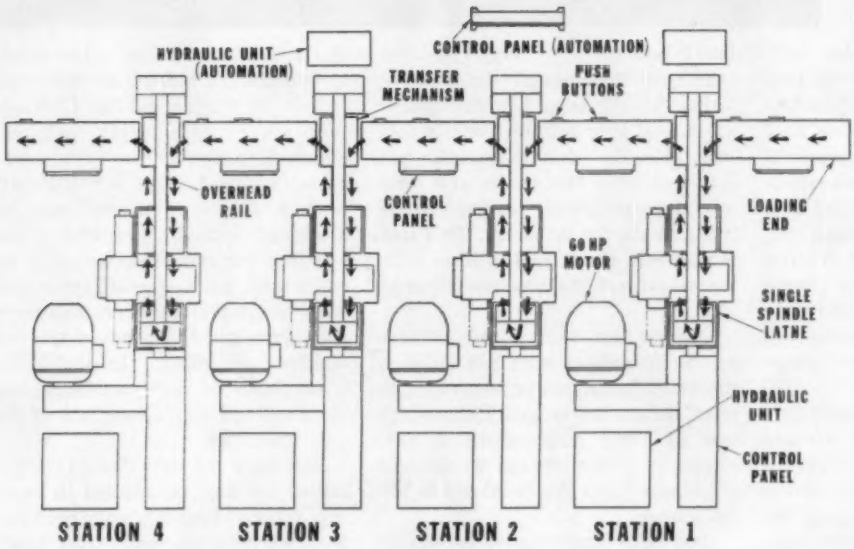




"Broach-puller" clamping arbor . . . expands a split sleeve on which gear blanks are loaded. Sliders engage tapered bore of sleeve to expand it when puller is drawn up in the headstock collet. Tailstock is withdrawn to release hobbed blanks by removing right-hand slider, which collapses the expanded sleeve







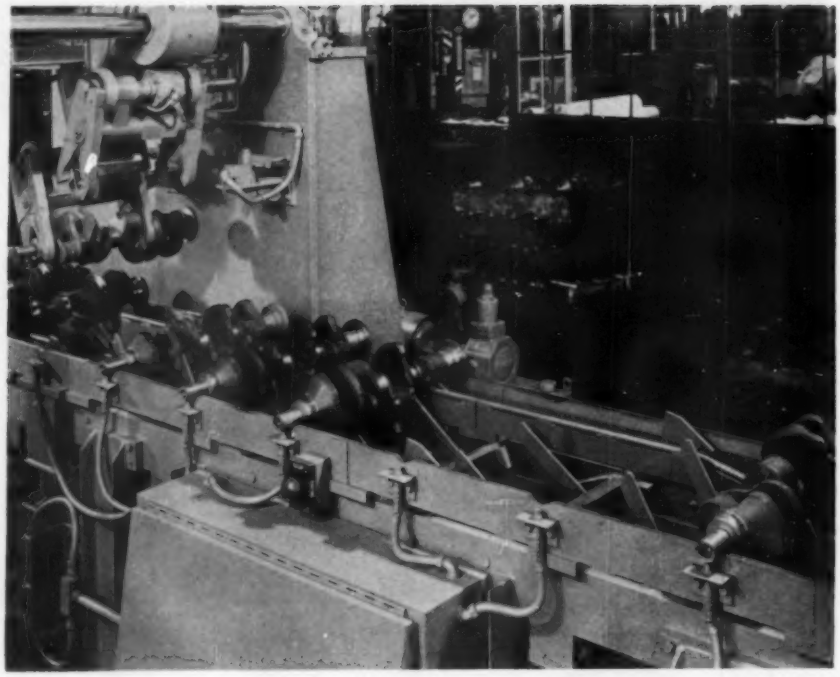
Integrated automation, carbides, and versatile lathes are combined in 4-stand crankshaft line. Overhead 5-ft cross-slide supports load and unload arms, which pick up work from chuck, replace it in shuttle conveyor, pick up next shaft, and place it in chuck for machining. Pin diameters are turned successively; station 1 does first pin dia, station 2 does second, and so on

Carbides cut forged crankshafts *for Pontiac*

Auto crankshafts are among the toughest machining jobs in metalworking. Besides being difficult to hold and clamp, they are not rigid; and deflection under cutting loads can create serious problems. Progress in machining these parts over the past few years has been mainly in the addition of automation to basic machines and in using shell-molded nodular iron and modified cast steel instead of CI. Cutting tools have necessarily remained HSS because the power and speeds necessary for carbides have not been available on these established machines.

But new machines with power

Carbides cut forged crankshafts for Pontiac . . .



Shuttle conveyor keeps eight shafts between each adjacent pair of machines; proximity switches stop motion when conveyor is full. When one machine is down for tool change, backlog of eight shafts keeps succeeding machines busy until retooling is completed. Inner conveyor arms advance a specific distance, then tilt down to clear following shafts as they retract

and speed have allowed cutting with carbides—a new possibility for crankshafts. The Machine Tool Div of Wickes Corp has engineered three new lines of four single-spindle machines each for Pontiac Div, General Motors Corp. These cut with standard single-point Wesson carbides at over 250 sfpm (compared to 60 sfpm with HSS)—although speed is by no means the only advantage of this new equipment.

Cast-iron crankshafts, machined in conventional equipment, are usually centered and milled to length, then milled to form locating spots. In a line capable of producing 180 crankshafts/hr, three special machines for this purpose would be necessary, plus four special center-drive lathes for turning the main bearings and ends. Four special multiple pin lathes would be necessary for turning the crank pins. Such a machine lineup would represent a capital investment of about $1 million, not counting automatic materials-handling equipment.

Forged-steel crankshafts, machined in a conventional manner, would require a more complex setup, including two special millers for a line capable of producing 150 shafts/hr. Ten special center-drive lathes would turn bearing diameters, and four grinders would follow. Twelve double-spindle pin lathes to take two shafts at a time would be required; six for roughing and six for finishing. This line would cost about $3.2 million with the usual automation beween machines.

One of the main disadvantages of the double-spindle pin lathe is the cost of changeover when crankshaft design is changed. Converting one of these single-purpose machines to a new design would cost anywhere from $20 thousand to $35 thousand.

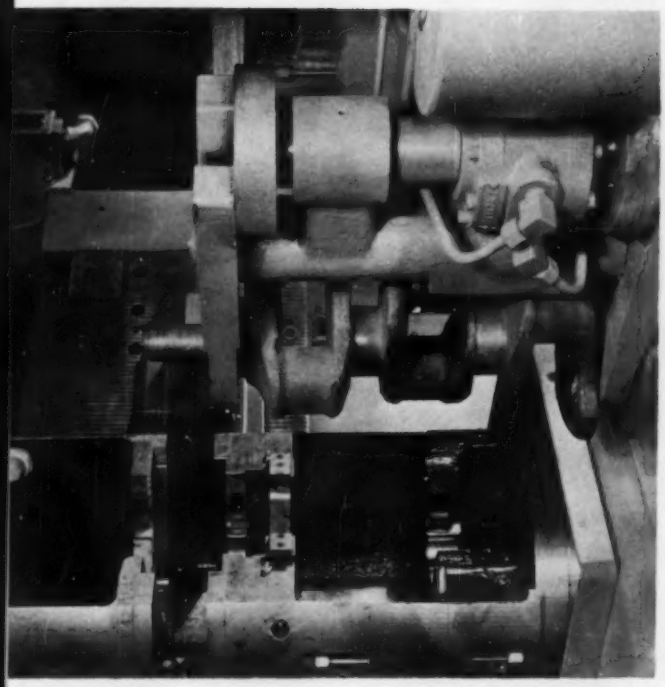
Top HSS performance for one of these machines would be 40 crankshafts between grinds, and the average monthly tab for 150 crankshafts/hr would be $20 thousand for cutting tools alone. Tool-changing time is from 45 min to 1½ hr per machine because each change involves 16 to 24 cutting tools per machine.

NEW APPROACH

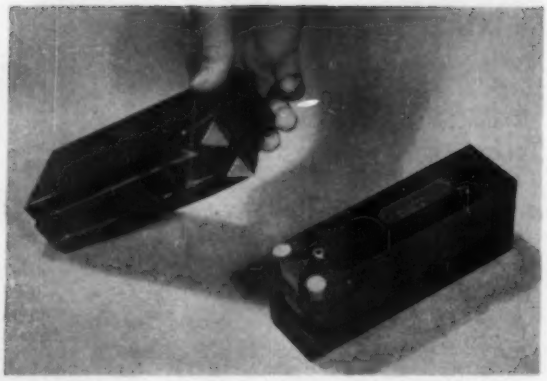
The new line of Wickes machines, connected by Wilson automation, takes a new tack. Each machine handles only a single crankshaft at a time and has sufficient power to utilize carbides at optimum speeds on forged shafts. Changeover costs are sharply reduced, which is probably an even more important advantage. A crankshaft with a different "throw" can be produced without practically rebuilding the machine, which is an important consideration in these days of frequent model changes—and redesigned engines with extensive retooling. In addition, crankshafts of various designs can be machined on a single line of the new machines.

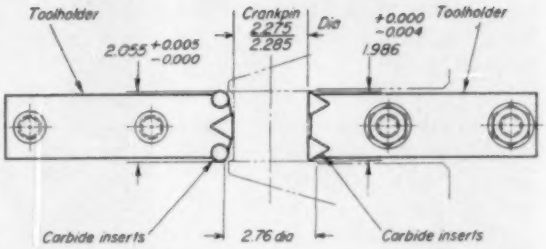
Although the new design for pin lathes can also be applied to bearing lathes, Pontiac will continue with existing equipment for bearing diameters for economic reasons.

On the new machining line, each pin diameter is finished in under a minute. Shafts are held in the chucks on previously machined bearing diameters for maximum rigidity and concentricity. Each machine in the line is a double-end-drive unit with opposed slides operated by shoes, rather than rollers, that engage the cam bar. Shoes absorb cutting-tool thrust and provide greater rigidity. Cross-slides and chucks are hydraulically controlled.

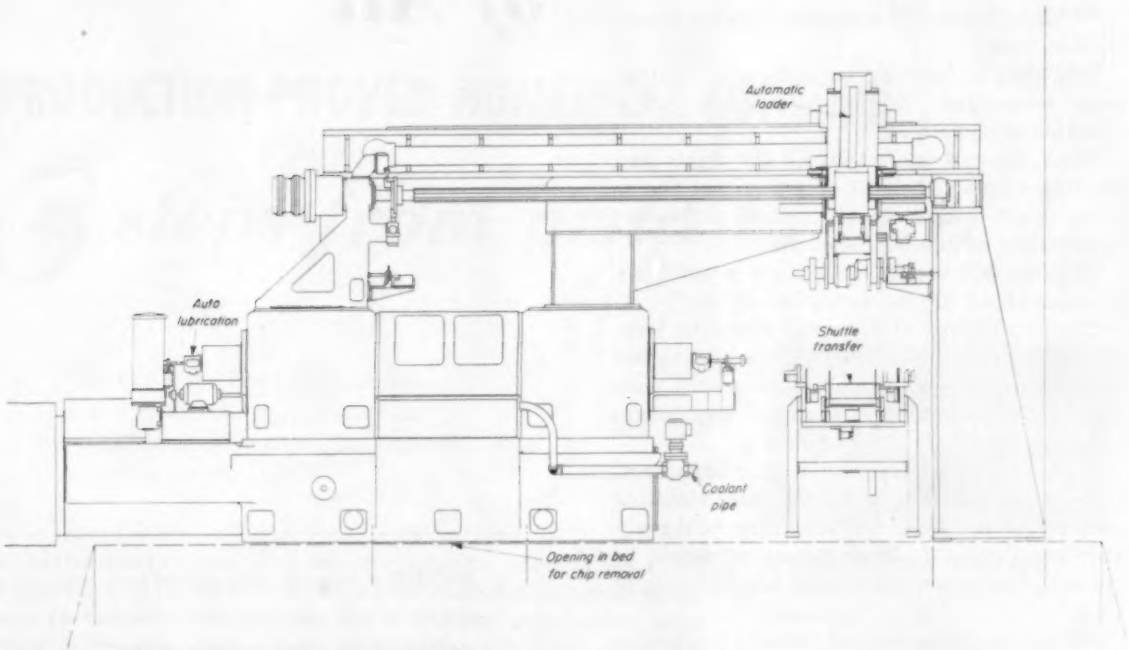


Automatic loader places shaft into nesting chuck, then machine clamps and starts turning. Front and rear toolslides work into recesses in chuck to infeed and plunge feed. Shim plates in chuck are easily replaced if engineering changes are made in workpiece





Special toolholders take standard carbide bits to cheek and turn pin dia complete in one operation. Two round inserts are at slight angle for negative rake on cheeking cuts; triangular bits are at zero or slightly positive rake for plunge forming



Wickes lathe has 60-hp variable-speed DC motor with rheostat control and cam-operated flow-control valve. Cutting speed of 250 sfpm is constant to ¼-in. depth of cut, with spindle speed ranging from 123 to 313 rpm. Plunge feed is about 0.010 ipm; width of cut is 2 in. If cheeking cut includes interruptions, feed is 0.040-0.060 ipm. Tool costs are about half with carbides. Machine includes automatic lubrication and simplified hydraulic and electrical control to reduce maintenance

Round Table...

Overseer of All

"Don't I have the right to give orders to a man who's not in my department, Ed?"

"That depends on circumstances, Al, but it's usually a touchy thing. What happened?"

"Well, I got a bit angry at this fellow Smith who comes over to see Murphy at lunchtime. He's always sitting around, eating his sandwiches, and he doesn't leave when the buzzer rings after lunch. He was sitting there about ten minutes late today, so I gave him a good bawling out."

"Why not tell his foreman, Al? Any foreman would want to know if one of his men was dogging it like that."

"I didn't want to bother, I guess. After all, he was interfering with my department, taking up Murphy's time, and preventing him from getting his work done."

"Then what happened?"

"Instead of getting back to work, like anybody would expect, he stood there and gave me an argument. We got into a real hassle, and I ended up telling him to stay the heck out of my department. But now I hear he's making a big deal out of it with the shop steward. He claims I was insulting and abusive, which I wasn't."

"What in the world were they talking about, all that time?"

"Oh, they're bowling buddies—play on the same team—and they were working out a schedule or something."

"Well, I'm not sure about all the rights and privileges involved, but I do know that you're liable to get into trouble if you assume the responsibility of another foreman."

"Maybe, but in this case there wasn't any question about the guy being out of line."

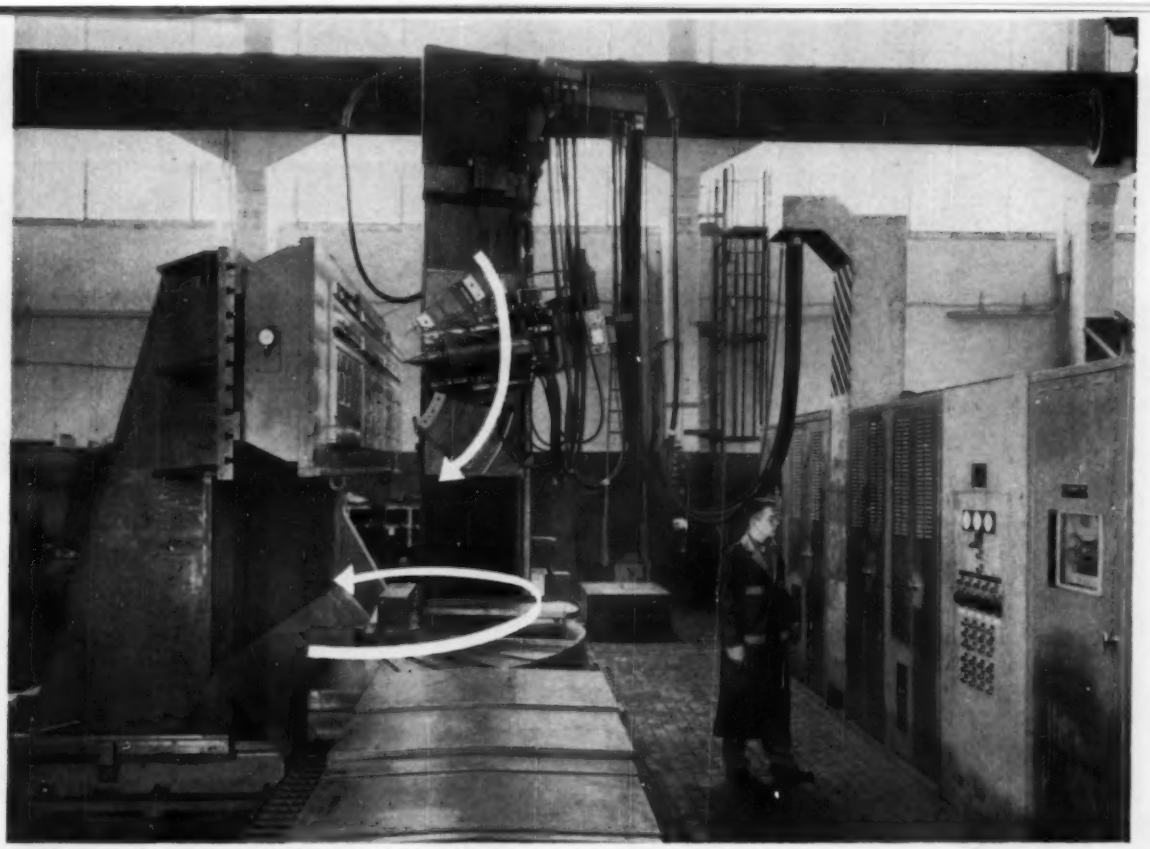
"That's your side of it, Al; but Murphy's foreman has a side, too. I imagine you'd rather hear about some kind of trouble one of your men got into before any action was taken, wouldn't you?"

"Sure, if there was grounds for argument; but in this case the guy was actually violating shop rules. If I didn't get after him, he'd probably keep doing it. That means he would be cheating his department and his foreman of time."

"Maybe you'd better let Murphy's foreman be the judge of how much Murphy's cheating him. I think it's bad business to interfere with another man's responsibilities and rights."

• • •

***SHOULD** a foreman have control over any worker in the plant, or must he report a violation to the man's direct supervisor? Your opinions may help others. Discussions of earlier topics start on page 209.*



Five-axis profile miller provides fully automatic control, from magnetic tape, of x, y, and z coordinates as well as rotation around two of these axes. Lieutenant General Clarence S Irvine, USAF's Deputy Chief of Staff for Materiel, says Air Force expects to achieve "significant production economies" with these systems in its contractor industries. Already, manufacturing costs on some complex parts have been cut 75 to 90%

PRODUCTION-PROVED NUMERICAL CONTROL:

3 steps from print to part

HARRY E ANKENEY, manager, Research
D H BINGHAM, JR, project engineer
GIDDINGS & LEWIS MACHINE TOOL COMPANY
FOND DU LAC, WIS

American Machinist

SPECIAL REPORT NO. 452

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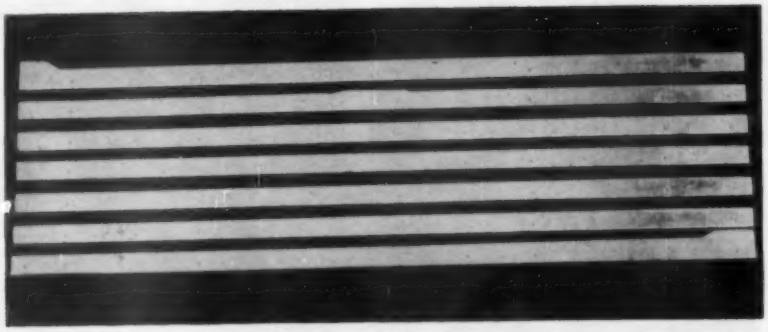
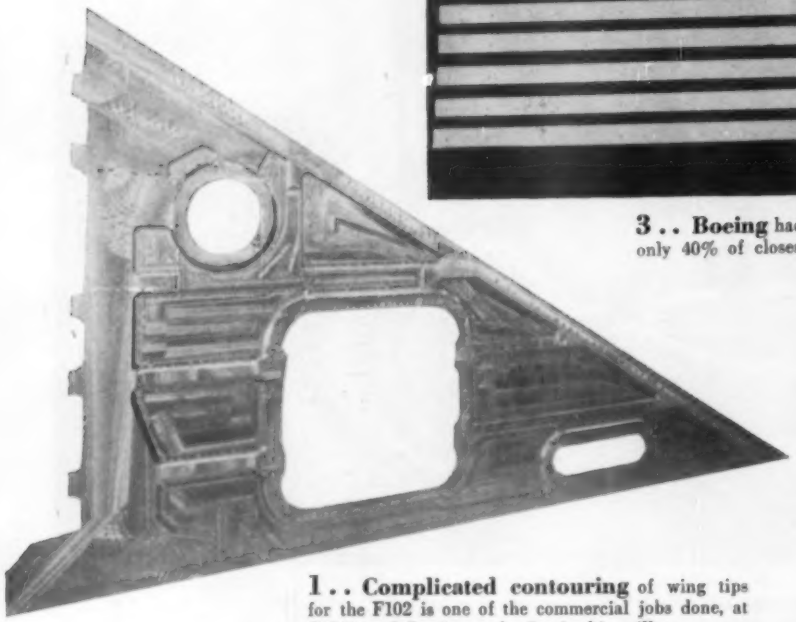
With more than two years of commercial application under its belt, G & L is unique among the builders of numerically controlled contouring equipment for aircraft manufacturers. One of the first companies to invest heavily in this new control concept, it provides an outstanding example of the techniques necessary to apply these developments to practice. Here, too, is a preview of the reports expected in a year or so, when the plane makers announce the results in production from their recently delivered machines.

3 steps from print to part . . .



3 . . Boeing had G & L produce these cams at a cost only 40% of closest competitive bid



1 . . Complicated contouring of wing tips for the F102 is one of the commercial jobs done, at Giddings & Lewis, on the 3-axis skin miller

2 . . Production time, compared with conventional methods, was cut 75% on an order of 200 of these horizontal stabilizers for the F100-D machined by numerical control

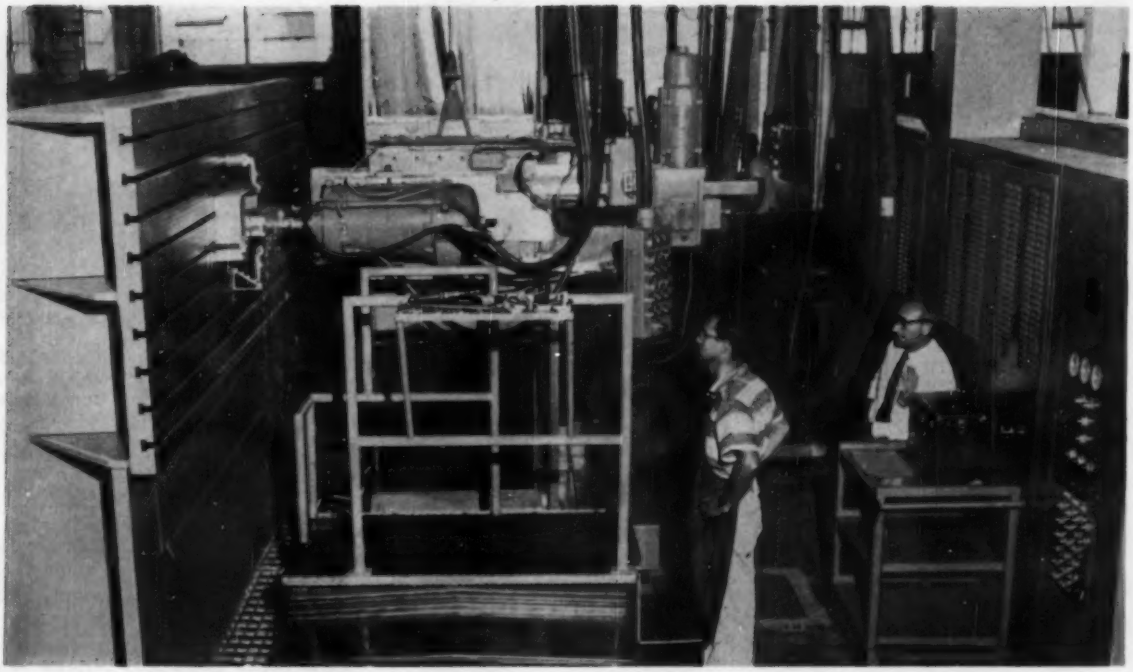
Since June of 1955 the Giddings & Lewis Machine Tool Company has been using a numerically controlled skin mill for commercial work. The reasons are two-fold: To gain experience in programming and in tape-controlled cutting; to obtain first-hand knowledge of the problems encountered with these machines in actual production.

The machine is controlled by regular machinists from the production shop, selected without special care; a minimum of instructions was necessary to teach them to operate it. Most training emphasis went into threading the tape through the transport, orienting the machine for the first run on a new tape, and explaining which buttons start and stop the process.

Some of the jobs included a few wing tips for the F102 (Fig. 1) and 200 horizontal stabilizers for the F100-D (Fig. 2). Currently the company is producing cams for Boeing (Fig. 3). Production time on the stabilizers is reported to be about one-fourth of that required by North American Aviation and its subcontractors—using tracer-control methods. The cam contract resulted from competitive bidding, and G & L's price was only 40% of the nearest competitive bid. Yes, the company is showing a reasonable profit on the order.

The first profiler shipped under the U S Air Force Air Materiel Command program was the "Variax" 3-axis high-speed unit (Fig. 4). Cost data was supplied by Lockheed on two parts produced on this machine. The total cost of machining one piece (Fig. 5) is $15.70, including a few operations subsequent to those done on the numerically controlled profiler. Previously, this part was purchased for $69.50.

The other Lockheed part (Fig. 6) was produced for $14.30, again in-



4.. First profiler shipped under the USAF Air Materiel Command program was this Variax 3-axis high-speed unit, which went to Lockheed, Burbank, on April 18, 1957

cluding some machining operations subsequent to those on the numerically controlled profiler. The previous purchase price was $40.35 per part.

Tooling costs have been excluded on both the numerically produced parts and the purchased parts. Also, programming cost is not included in the Lockheed-produced piece. However, on a reasonable quantity, the cost of programming is easily paid out of the difference between these figures. Similarly, tooling for the part made by tracer methods would be more expensive because of the need for templets. In many cases, the costs of templets equals or exceeds the cost of programming.

These are indications of the remarkable improvements in productivity available with numerical control. Rather than exaggerations or selected cases, two-years-plus of semi-production indicates that they are the results to be expected.

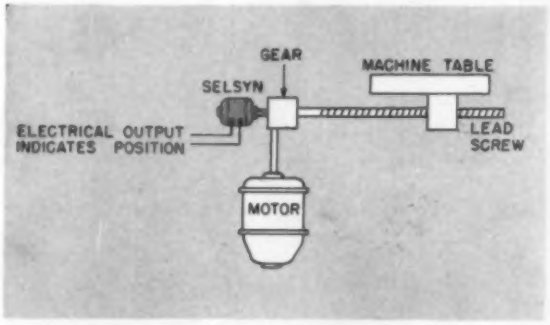
What is the background, the origin of this new and cost-shattering control technique at Giddings & Lewis? What are the elements that comprise the complete control application?

Historically, Giddings & Lewis has provided machine tools for the aircraft industry over a span of many years. Tracer-controlled, horizontal and vertical boring mills have been supplied in a variety of forms. The Giddings & Lewis skin mill, developed from the company's

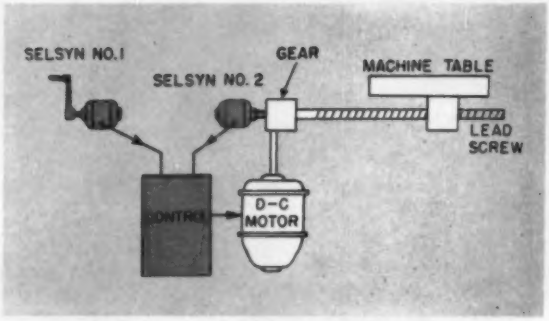
5.. Total cost of machining this Lockheed part is $15.70. Previously, part was purchased for $69.50

6.. Another Lockheed part, machined on the 3-axis unit, cost $14.30 against an original cost of $40.35

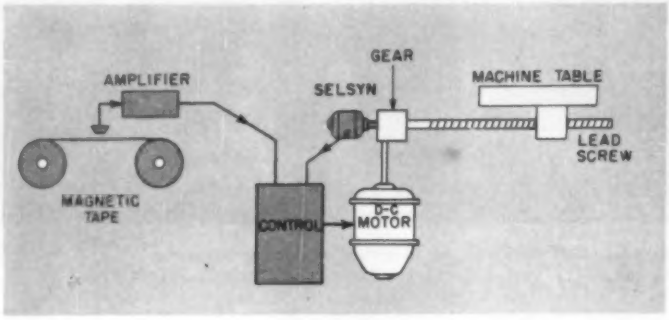
3 steps from print to part . . .



7 . . "Selsyn" provides, electrically, continuous indication of feed position



8 . . Two selsyns provide comparison between where you want the table and where it is; then feed a control voltage to the drive motor



9 . . Tape and amplifier combination replace the director selsyn. This is the heart of numerical control

planer-miller design, is used by most airframe manufacturers.

Activities in the aircraft machine-tool field led to the realization that a new concept in machine-tool control was necessary if machining of these complex frame and skin shapes was to be performed efficiently. The problem would become even more critical if military planes were required in quantity.

In 1950, G & L engineers studied the General Electric record-playback system with its control of machines from magnetic tape. However, this technique required a machine equipped with complicated tracer control and templet mountings to make the magnetic-tape record. Tracer systems are basically error-producing in that they use a number of steps, all subject to error, between the design specification and the finished product. Also, templet construction and mounting results in limited accuracy.

In 1951, the MIT version of a numerically controlled machine tool was investigated. However, the idea of providing a numerical control system for each machine, and maintaining its complex electronic system under shop conditions, seemed a major practical drawback.

Then a Giddings & Lewis engineer conceived the idea that the advantages of the two systems could be realized if the numerical director could accurately record its data on magnetic tape in such form that a simple machine control could read the signals and accurately control the machine.

In 1952, management authorized a research program for the development of this idea. The Servomechanism Laboratory at MIT was asked to study the possibility of building a magnetic-tape-recording Director and the feasibility of applying numerical tape control to several Giddings & Lewis machine tools. The answer resulting from the study was an enthusiastic "yes," so an order was placed immediately with MIT for a numerical director.

Another order was placed with General Electric for a magnetic-tape machine control, which was delivered in October, 1954. After it was mounted on the machine, de-bugging work was started and about eight months were devoted to eliminating errors and improving operation. On June 6, 1955, public demonstrations were held to prove that this system, christened Numericord, was a working reality.

The Numericord System consists of three steps from drawing to part. The first step is data processing or programming. The second step is making the magnetic tape for machine control and the last step is the actual machine control.

SIMPLIFY MACHINE INPUT

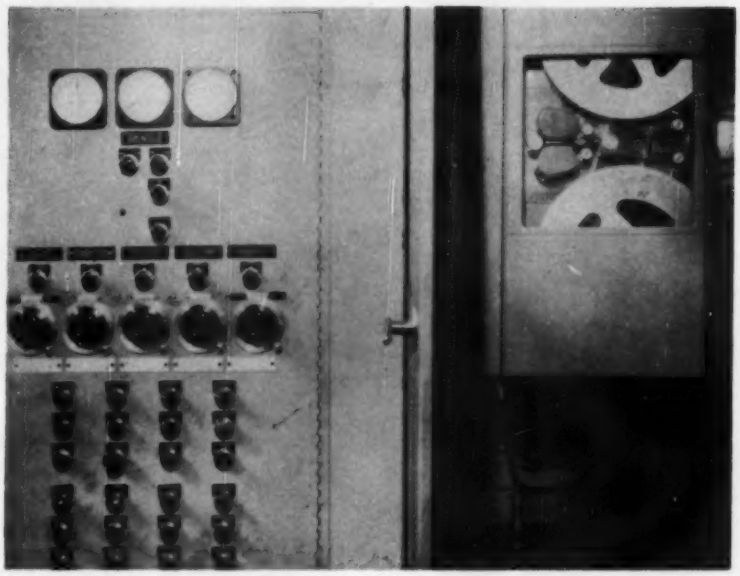
Various other system manufacturers have chosen other places to divide the operations. G & L selected these divisions because its first aim was to achieve maximum productivity at the machine tool. This was accomplished by minimizing the amount of electronic equipment at the machine control and by building whatever electronic equipment was necessary as simply and ruggedly as possible, for utmost reliability and ease of maintenance.

To do this meant supplying the machine control with completely interpolated data, and the best medium for carrying this data was a magnetic tape. The interpolator, with all its complicated electronics,

can be kept out of the production area and one interpolator can serve many machine tools. Interruptions in *tape production* will not cause interruptions in *parts production* because the machine tools can continue making parts from existing tapes.

Computation and programming was kept a separate function because the Numericord system can handle five separate motions simultaneously and such programming is best done in large-scale, general-purpose computers. The original evaluation of this problem has proved correct. Even two and three axes of simultaneous motion are now being computed on such units as the IBM 704.

By describing the machine control first you can see what information is required on the magnetic tape. Then a description of tape making will show the information required at the input. Finally, a discussion of data processing completes the cycle.



10.. Control station of Numericord system has magnetic tape transport unit (right) and operator's control panel (left) with switches and pushbuttons for all machine functions, plus feed-rate and horsepower meters. Five large knobs in center of panel turn differential selsyns used for initial setups

POSITION ALWAYS KNOWN

Each machine feed is equipped with a servo drive to move it accurately and, at all times, in accord with the command signals. In the G & L machines, a DC motor powered by an amplidyne generator provides this servo drive. It could as well be a hydraulic motor or cylinder controlled by an electro-hydraulic valve.

A synchro geared to each feed provides an accurate indication of the feed position at all times. (A synchro is a small electrical device which produces a voltage that indicates the angular position of its rotor.) When a selsyn, one type of synchro, is geared to a machine feed (Fig. 7), it provides a continuous indication of feed position. To understand, fundamentally, how Numericord operates, consider first a common servo followup system (Fig. 8). Here a master or a Director selsyn and some control equipment have been added to equipment shown in the previous figure.

Output voltages from the selsyns are compared by the control equipment and, if there is any difference, the control causes the motor to operate and rotate selsyn No. 2 until it is in angular correspondence or synchronized with selsyn No. 1. This is a continuous checking process; hence if the crank driving synchro No. 1 were turned forward, backward, then started and stopped, the motor would cause selsyn No. 2 to continuously stay in synchronism with it and go through exactly the same motions.

Because the machine table is geared to the same motor, it will move correspondingly. In such a servo system, selsyn No. 1 simply provides a voltage signal indicating its angular position. By replacing this director selsyn with a magnetic tape and amplifier (Fig. 9), the amplifier reproduces, from signals recorded on the tape, the same type of voltage normally produced by the director selsyn. Thus, the same control equipment will cause synchro No. 2, and consequently the machine feed, to remain synchronized with the information recorded on the magnetic tape.

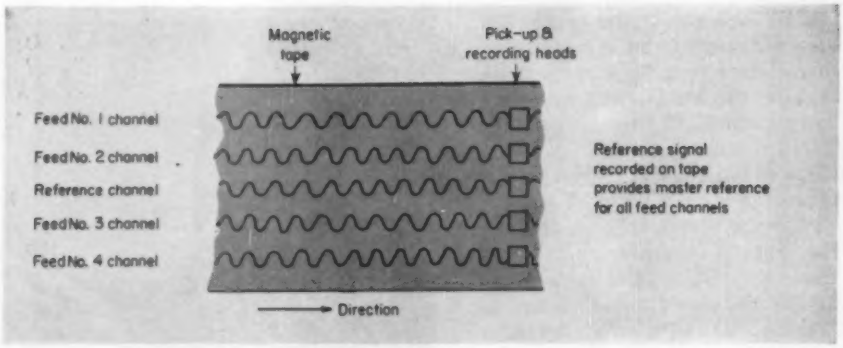
Because it is necessary to control all the feeds of the machine, the equipment described above is duplicated for each machine feed—except that a single magnetic tape is used. The program for each feed is laid down as a separate channel on the tape.

Roughly, 1/16-inch of tape width is necessary for each channel, hence a considerable number of machine feeds can be simultaneously controlled from the 1-in.-wide tape that is used. A single 14-in.-dia reel of tape is 7200 ft long and will control the machine for 1½ hours.

There is no particular relationship between the tape length and the distance moved by the machine feed. Therefore, stretching the tape has no effect upon the accuracy of the produced part. Signal relationship is maintained by recording a separate signal on a channel of the tape to serve as a reference for all machine axes.

Movement by a machine feed is represented by a change in the phase relationshp between the signal on the corresponding motion channel and the signal on the reference channel. Each feed position is checked against the recorded program 200 times per second and any error in its position results in instant corrective action by the control. Movements are therefore continuous and not by steps, hence smooth three-dimensional shapes may be machined.

At the machine tool, the signal


Magnetic tape
Pick-up & recording heads
Feed No. 1 channel
Feed No. 2 channel
Reference channel
Feed No. 3 channel
Feed No. 4 channel
Reference signal recorded on tape provides master reference for all feed channels
Direction

11 . . Magnetic control tape supplies machine input

picked up from the reference channel is used to excite the stators of all of the synchros on all of the machine motions. The output from the synchro rotor for each machine feed is compared in a phase discriminator with the output from the motion channel on the tape corresponding to the same machine feed. This motion-channel signal from the tape is tied to the reference-channel signal on the tape by the physical unity of the tape itself. Therefore, any discrepancy between the signals in the phase discriminator is handled as an error signal and results in an output voltage which will cause the appropriate corrective action.

CONTROL BY NUMBERS

To make this clearer, let's assign numbers to some of these items. First, the synchros are geared to the machine elements so they rotate one revolution for each 1/10 in. of movement. If the machine feed is at a standstill, signals are entering the phase discriminator at 200 cycles per sec. If the machine feed is moving 1/10 ips or one revolution of the synchro per second, the frequency at the phase discriminator is either 199 or 201 cycles per second, depending upon the direction of movement. At a machine speed of 120 ipm, the synchro is rotating 20 revolutions per second and the frequency at the phase discriminator would be either 180 or 220 cycles per second.

To measure the tool position as closely as possible, the synchro used to indicate machine position is driven from a separate precision rack mounted directly on the machine element being controlled. Because the synchro represents an insignificant load on this rack and gearing, wear is negligible. Also, this instrument gearing is torque-motor loaded to eliminate backlash.

As this is a velocity error system, there must be some error generated in the phase discriminator before it can produce an output voltage calling for motion. However, because of the high amplification and feedback available with electronic control, this error is kept to a very low value. The system should be set up to give about 4 ipm per mil of error. This means that at 120-ipm, the error will be about 0.030 in.

This does not mean that there will be an error of 0.030 in. in the work because, if the machine is cutting along one axis, all it means is that the cutter is 0.030-in. behind the command signal. The machine will still cut along exactly the right line and when the command velocity is reduced to zero, the error will be reduced to zero and the tool will catch up.

ERROR MINIMIZED

Even when work is cut at an angle invloving two or more motions, the lag along each of the components is proportional to the speed of that component. Therefore, the tool is *still* cutting along the intended line. Only on curves where the angle is continuously changing does any error occur and, even on short radii at high speed, the amount of this error is negligible.

If the error should exceed 0.050 in. the synchro would fall back one whole cycle and even if it should resynchronize, would be 1/10 of an inch in error. To provide a margin for reliable operation, the control is provided with excess-error relays which are set to trip at about 0.042 in.

MANUAL SETTING

When the machine is set up for initial operation, a section of tape is used which calls for a standstill of all feeds. By manual control the machine is brought to approximately its starting point and then is put under control of the standstill tape. Using differential synchros, the operator can move any motion in either direction by whatever amount desired. Then, with gage blocks, or indicators on pins, a final precise setting is achieved and the differential synchros are locked in place.

When the regular production tape is run, it is only necessary for the operator to bring the machine elements within about 0.050 in. of this starting point and then start the tape. During the first five seconds of the tape, which calls for zero motion for synchronizing purposes, the servos are excited first at low amplification and then, after a couple of seconds of time delay, at high amplification to lock them in exactly the correct positions.

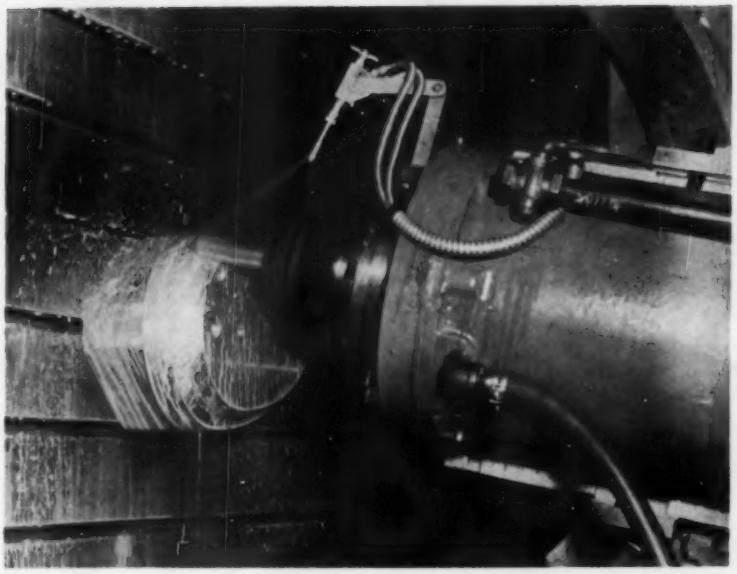
Each time the tool is not cutting and the feed motions are at a standstill, the programmer should have coded on the tape an auxiliary function referred to as a *planned stop*. In normal operation, the machine will not stop when this code is read, but during the machining of the first part, the operator's manuscript should be marked with the vernier reading of all scales at each of the points. Each of these points should be previous-

ly indicated on his manuscript by a footage count on the tape.

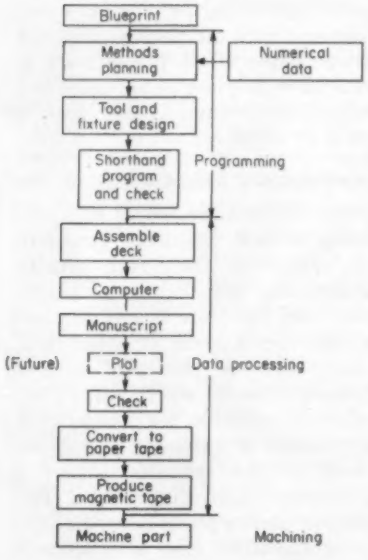
In case of power failure, tool breakage, or some other accident during cutting, it will not be necessary for the machine operator to go back to the beginning of the program, but only back to the most recent planned stop. At this point, he can set the machine elements approximately on the vernier readings and, when the tape is restarted, all motions will synchronize themselves and proceed without error.

Anytime during running that the operator cares to stop at the next convenient point, he can press the "planned-stop" button. When the next planned-stop code comes along on the tape, the machine tool and the tape transport will stop. As soon as he has checked the work, or done whatever he had in mind, he can press the start button and the work will proceed.

Another transport control coded on the tape is the *playback stop*, which will stop the tape transport and the machine tool whenever it arrives at the tape reader regardless of whether the operator has pressed a button or not. This code is used whenever the operator is to make an inspection, change a tool, or perform some similar function on every piece. It is also used at the end of the tape, when the work has been completed.



12 . . AMC test piece being machined at G & L on first five-axis "Variax" profiler controlled from magnetic tape by "Numericord" system. Mist cooling is used for HSS cutter, with coolant nozzle adjustably mounted on spindle quill



13 . . Elements of processing, from print to part, reduce to three major steps: 1. Programming, 2. Data processing, and 3. Machining

In addition to controlling the feeds on the machine, the Numericord system also controls what may be termed "On-Off" functions. These are the functions ordinarily initiated by a push-button or limit switch, such as turning coolant on and off or shifting control from one milling head to the other. Additional channels on the tape are used for these functions, with a signal recorded wherever a particular device must operate. Several functions can be controlled from a single-tape channel by using signals of a different frequency for each function. At present, six channels with two frequencies each are used for this purpose, but this is by no means the maximum number which can be handled.

Thus, as the part is made, the magnetic tape has complete control of the machine. It not only controls the movement of all of the machine feeds, but also performs essentially all the other functions normally performed by the operator.

The Director puts these commands on the magnetic tape as they are needed by the machine tool.

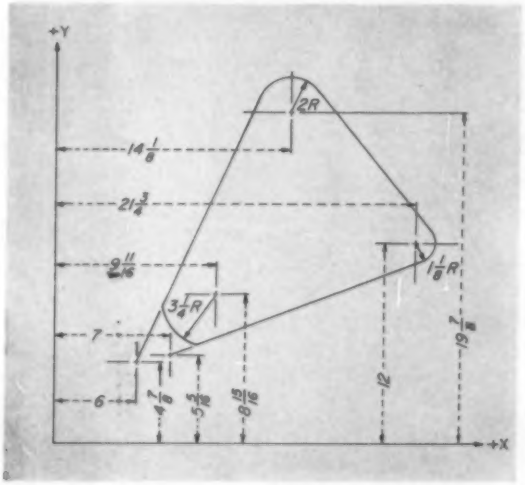
More descriptively, the Director might be called an interpolator because it interpolates as many of the machine-feed motions as are necessary to cause the cutter center to move from one point in space to another point in space along a straight line. Commands to the Director are based on the time the machine should take in going from one point to the next and the distance each motion should move to get the cutter to the next point.

PROGRAM TO 0.0005 IN.

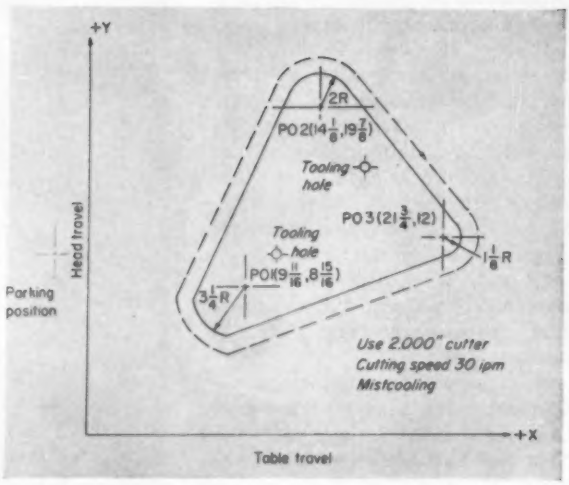
Time commands available to the programmer are ½, 1, 2, 5, 10, 20, 50, 100 and 200 seconds. Distances are given in decimal form to the fourth place, except that the fourth place can only be a 0 or a 5. That is, the smallest programmable increment, other than 0, is 0.0005 inch. Each distance specified is preceded by a + or – sign to indicate direction.

To produce any curve its form must be divided into small straight sections, the lengths of which vary with the degree of approximation. The closer the approximation must be, the greater the number of straight-line sections required. The discussion of programming will

3 steps from print to part...



14.. Mill periphery



15.. Working print

show how the correct length of section is achieved.

Input to the Director is from punched tape. When this tape is read the numbers are taken off in serial form. Because the interpolator requires them all at once, these numbers must be delivered in parallel form. Delivery is accomplished by a magnetic-core storage unit which is always filled with the next block of information required, ready to dump it into the interpolator.

CLOCK CONTROL

In the interpolator, a command clock generates a large number of pulses each second, and each pulse is equivalent to a fixed distance of motion. For the machine to run at maximum speed, the maximum number of pulses is allowed to come through. For lower speeds, "gates" in the electronic control allow a lesser number of pulses to come through. The number of gates opened or closed is controlled by the distance to be traveled. In any case, the pulses which are used are evenly distributed over the command time period so that the rate of motion is uniform along each axis. Therefore, each feed motion will have completed its component of the total motion in the same length of time, and the resultant will be a straight line of motion between the two points in space. Where angular movements are included in addition to the three cartesian coordinates, they are completed in the same time.

For acceleration and deceleration a modification of the command clock rate is performed by a replacement of the + or – sign ordinarily used by the programmer with the symbols "p" or "m". The symbol "p" means plus to the director, but at a modified clock rate, and "m" means minus with the same modification.

Assume that the cutter is to move 10 in. at 60 ipm and stop at the end of that movement. The programmer selects 10 seconds as his time interval and puts a "p" before the 10-in. distance. Shortly before the end of the command-time interval, the command-clock pulse rate will be reduced exponentially by the "p" command to 5% of its original value. At this point the rate will be clamped until the required number of clock pulses has been generated. In the next command, the clock rate will be increased to 100%, again along an exponential. This increase is used for acceleration.

Each of the pulses referred to previously is used later in the interpolator to shift the phase between the motion-channel signals and the reference-channel signals by a fixed amount. The angle, or number of degrees of shift, between these signals is only by fixed increments. It is not analog. An infinite number of phase angles between the signals is not possible, for all the commands are handled in a digital form right up to the recording on the magnetic tape.

Provision has been made on the Director for manual adjustment of feed rate during processing of the magnetic tape. Ordinarily the clock is set at 100%, but if the programmed rate is too high for the particular part configuration, tool life, or for some other reason, it is only necessary to make a new magnetic tape using the original paper tape and turn the clock setting to a lower value while the motions at excessive rate are being recorded. Adjustment range of the clock is 20% to 125%.

DIMENSIONAL READ-OUTS

The Director system is equipped with decimal positional read-outs for each axis. These read-outs algebraically sum the commands for each axis and provide a continuous visual presentation of these data. Each axis is provided with a "coarse" counter which keeps track of gross motion to the nearest inch. By means of appropriate coupling keys, a "fine" counter display is connected to any desired axis. This display shows position to the least programmable unit of 0.0005 in. The total range of the read-out is 7 digits. These counters show the operator that the Director has accurately processed all dimensional

commands called for on the paper tape, for the read-out must match an independent summation taken from the program manuscript.

Auxiliary command functions for such things as starting and stopping the coolant, and transport control signals for planned or playback stops, are coded directly onto the magnetic tape whenever they are read from the paper tape without having to go through the interpolating section of the Director.

INFORMATION PROCESSING

Programming is the key to the numerical control concept; the transition from the detailed working drawing of yesterday (and today) to the working *manuscript* of tomorrow. Actually, with numerical control the drawing is not essential —except that the technique is so new that the programmer may find a visual reference helpful. The industry isn't ready to dispense with drawings, or at least sketches, yet.

Operation of the machine has been described and the method of introducing commands to the machine has been explained. Knowing these things, and having average familiarity with metal working processes, the foundation is laid for understanding programming procedure. In programming, the data-processing phase is the only really new procedure in the manufacturing cycle.

Approximately two years ago, Giddings & Lewis started a project with the Numerical Analysis Laboratory of the University of Wisconsin. The goal of this project was a program for the IBM 650 computer designed to accept symbolic input and have a punch card output having data acceptable to the G&L Numericord Director. After one year of effort by the University of Wisconsin, the program was turned over to Giddings & Lewis, and with the help of the Applied Science Division of IBM, a working program was developed.

At the start of the program, it was designed to handle straight lines and circles and all combinations of these two geometric configurations. The use of an IBM 650 without tape or disk storage requires that the material make two passes through the computer, with part of the output of the first pass being the input to the second. However, even in this situation, the following optional equipment is required in addition to the basic computer:

1. Pilot selectors 11 through 20.
2. Co-selectors 9 through 12.
3. Half-time emitter, read.
4. Half-time emitter, punch.
5. Punch code selectors.

Use of extra storage on the IBM 650 would eliminate the card handling between passes, but would require modification of the present program.

During the past nine months, G&L has programmed and machined approximately 1850 different parts using these computer routines in conjunction with Numericord-controlled machine tools. Programming is probably best described by example. Fig. 13 shows the flow sheet of a part from the blueprint stage to the machined article.

The first two operations, methods planning plus tool and fixture design, are performed simultaneously because of the need for coordination. At this time, location of the part on the machine, machine motions to be controlled, optimum feed rates, mode of operations, necessary auxiliary functions (such as coolant, automatic clamping, and chip collecting), tooling holes, cutter sizes, and physical location of all moving elements with reference to the workholder at the start of the program as well as during cutter changes— are established.

METHODS PLANNING

Assume that the job is to mill the periphery of the part shown in Fig. 14. The blueprint, as received by the methods planner, designates only the radii and centers of the three circular arcs.

The methods planner outlines the cutter path desired for machining the part. At this time the planner also calls out all of the additional points required to designate the cutter path. The working print now appears as shown in Fig. 15. This print is forwarded to the programmer for preparation of the problem deck for delivery to the computer.

With the IBM 650 program used by G&L, it is not necessary to show on the drawing the coordinates of all the points of intersection and tangency. The programmer lists on his outline sheet all the known coordinate points and uses a simple symbolic notation for all other points required. Thus, many hours of part design are saved by relieving the design engineer of calculating these points for inclusion on the blueprint. The programmer also lists the cutter path, coded for input to the computer. This path portion includes all information as to cutter diameter, direction of path around contour, depth of cut, and tolerance. These two sections are called the description and path; together they comprise the input to the first pass of the computer.

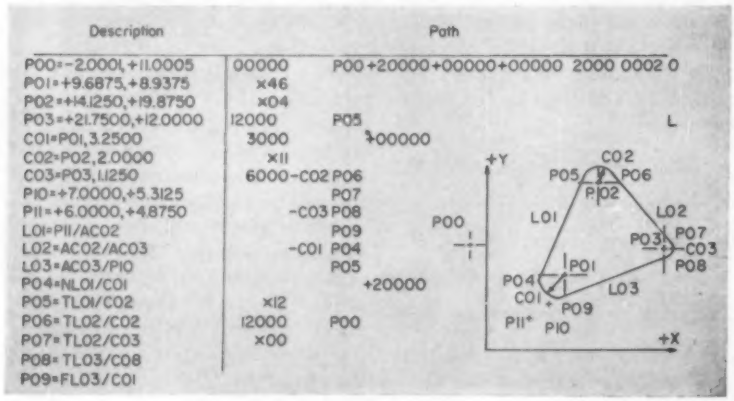
SUB-ROUTINES SAVE TIME

Fig. 16 shows only six numerical values; all the rest are symbolic. Circles are listed with the "x" and "y" coordinates of their centers and radiuses. All other points are calculated by the computer. The sketch shows a combination of circles, straight lines and points. Similar routines are being developed for ellipses, parabolas and hyperbolas.

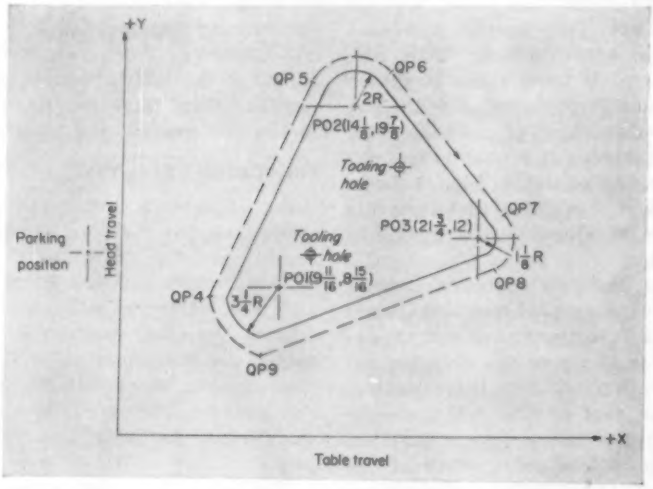
The path information shows the coding for machine axes used, mode of Director operation, auxiliary functions, and the sequence the cutter is to take in machining the contour. This information is sent to the tabulating section for key punching. A card is punched for each item in the description and the path. The description deck, followed by the path instructions, is fed into the computer.

The output of this first pass is also in two sections, labeled again *description* and *path*. However, this output description differs from the original input in that all points have been given numerical values (Fig. 17). All points prefixed by the letter "Q" have been calculated. The description cards serve no further purpose, except that they can be used as a check of the analytical computations of the computer and program. The path

3 steps from print to part . . .



16 . . Elementary breakdown



17 . . With numerical values

portion of this output contains numerical values for each point adjusted for cutter offset, all the information as to machine axis selection, mode of operation, auxiliary functions desired, tolerance, and direction of cut. These two decks can be easily separated on a sorter, because the new path deck has been re-serialized for proper input to the second IBM 650 program, while this has not been done with the description cards.

The second part of the IBM 650 program solves the time-distance problems and also finishes the remaining analytic geometry, which is the subdivision of circular sectors along the path into approximately straight segments. To cut the outside of a circle, the arc is replaced by a sequence of *circumscribing tangential segments.* To cut inside, the arc is replaced by a sequence of *inscribing chords.* This is the point in the program where tolerance is a prime factor. Fig. 18 shows inside and outside cuts. The IBM 650 has been programmed to calculate the chord or tangential segment small enough to keep the error (shown in the sketch as "T") below the specified tolerance.

The time-distance problem of the second IBM 650 pass is largely that of selecting the numerical values for the points along the cutter path and breaking down the distance between these points into segmental motions for each machine-tool axis compatible with the time intervals available at the Director. The feed speed as specified in the original input is a vector speed rather than a speed for any given axis. This portion of the computer routine also solves all acceleration and deceleration problems peculiar to the Giddings & Lewis machines.

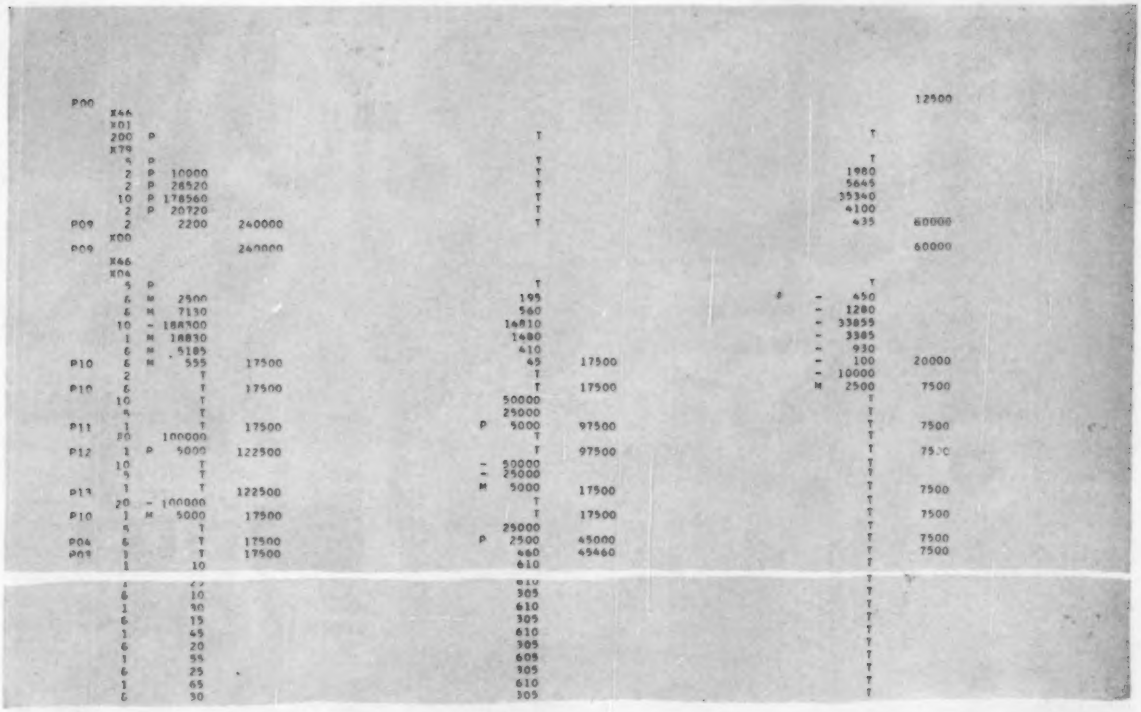
As each point (either given in the original input or calculated during the first pass) is reached, a summary card is punched showing the x, y, and z coordinates of the cutter. All machine axis selection, mode of operation, and auxiliary function codes required are carried through this portion and inserted automatically in the proper position of the program. Output cards from this pass are printed on an IBM 407; the print-out serves as the manuscript for later Director and machining operations.

PRINT-OUT SHOWS VALUES

Fig. 19 shows the IBM 407 print-out, including the axis selection code to the director, codes for mode of operation, auxiliary functions, incremental time and distance commands, and coordinates for all points. You will notice the values of these points are in the same form as shown on the original drawing. Output cards are sent to an IBM card-to-tape converter where a paper tape coded for the Numericord Director is produced.

G & L was asked to program a part for the EIA symposium held in Los Angeles on Sept 17-18. The part print as received from the designer included the laborious task of calculating all of the points on the cutting contour. Fig. 20 shows this part print after methods planning. The "print-out," Fig. 19, gives the details. The part is to be machined on a profiler, with a 2.500-in.-dia cutter for milling the outer periphery and a 1.000-in.-dia cutter for the inside pocket, using a feed rate of 30 ipm for the straight cuts and 10 ipm around the circles. The part print specified a tolerance of 0.0002 in. on circle radii. The point, P00, has been added for a coordination point; lines were scribed on the stock through this point for use during the orientation period.

P09 with coordinates of + 24.0000 and 0.0000 has been established as the *parking position.*



19.. "Print-out" of computed program shows all information, in correct order, as it appears on the tape

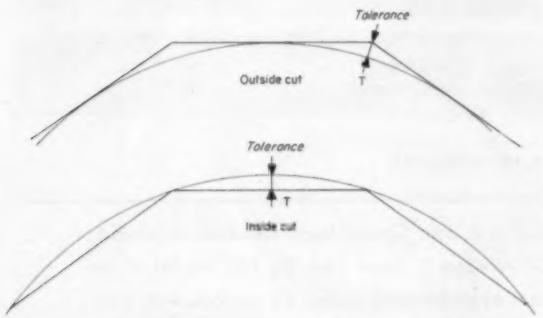
Points 10 to 13, and 17 to 29 have been arbitrarily established for clean-up of the excess stock around the outer edge and inside the pocket. The cutting path has been established as moving from point 10-11-12-13 and back to 10; around circle C01 in a negative direction to point 03. At this time, the cutter will rise from the work and return to the park position for cutter change.

After cutter change, the head moves to P07, plunges to the proper depth, moves around circle C02 in a positive direction to point 08, around circle C03 in a positive direction to P05, then to P06, 17, 18, 19, 16, 18, 15, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, then raises the cutter and returns to the parked position.

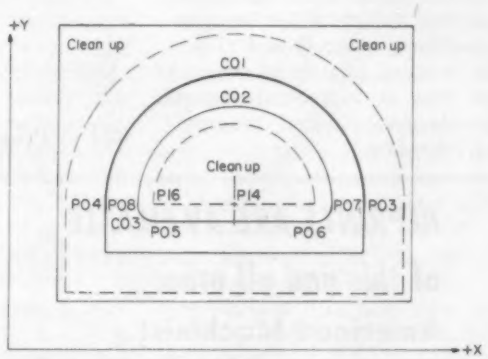
Fig. 21 shows the short-hand program manuscript for the description and path. The complete methods planning and the preparation of the manuscript took 40 min. The cards were key punched, verified, and tabulated in 45 min. The first pass through the computer took 2½ min; the second pass 15½ min for a total computer time of 18 min. The manuscript was prepared on an IBM 407 in 4 min.

Then the cards were put into the card-tape converter and a paper tape processed for the Director. Converter time was 16½ min. Finally, the magnetic tape was processed by the director and the part was machined in 14½ min. Total time from blueprint to magnetic tape is: 2 hr and 18 min from print to tape and an additional 14½ min for machining.

Some 18 months ago the Aircraft



18.. Programming of cuts differs in that outside cuts are produced by a series of circumscribing tangential segments while inside cuts are inscribed chords. Error "T" is held within specified tolerance

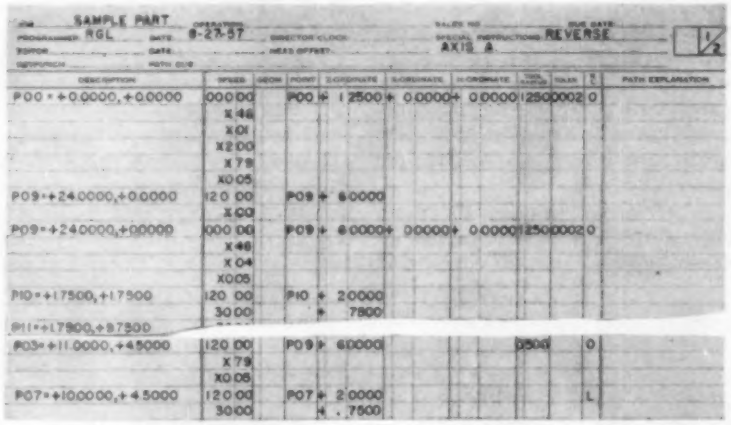


20.. Part print as it appears after methods planning

3 steps from print to part . . .

22 . . Boeing Airplane Co, Wichita, Kansas, received this first commercially built Numericord system, designed and manufactured by Concord Control, Inc, of Boston, for Giddings and Lewis. Aptly called a data-processing center, it produces magnetic control tapes for many different machines. Machines built by at least three different machine-tool builders participating in the USAF-AMC program will have, or will accept, input from control tapes prepared on Numericord Directors. Operator has full control of programming

Industries Association's Sub-Committee for Numerical Control submitted a test piece and a questionnaire to the various builders of numerically controlled machine tools. (Results of this questionnaire are now available in an AIA report.) At that time, Giddings & Lewis was in the early stages of applying a general-purpose computer to programming. The test piece required 66 hours to program manually, using desk calculators. Since then this part has been reprogrammed, using G & L's computer routines, in only 42 *minutes*. Thus, use of a general-purpose computer has reduced programming time 98%.



SAMPLE PART — PROGRAMMED NGL — DATE 9-27-57 — EDITOR — DATE — DIRECTOR CLOCK — HEAD OFFSET — SPECIAL INSTRUCTIONS REVERSE — AXIS A — 1/2

DESCRIPTION	SPEED	GEOM	POINT	X-COORDINATE	Y-COORDINATE	H-COORDINATE	TOOL NO.	TOLER	T	PATH EXPLANATION
P00 = +0.0000, +0.0000	000 00		P00	+ 1 2500	+ 0.0000	+ 0.0000	1250	0002	0	
	X 46									
	X 01									
	X 200									
	X 79									
	X 005									
P09 = +24.0000, +0.0000	120 00		P09	+ 60000						
	X 00									
P09 = +24.0000, +.00000	000 00		P09	+ 60000	+ .00000	+ 0.0000	1250	0002	0	
	X 46									
	X 04									
	X 005									
P10 = +1.7500, +1.7900	120 00		P10	+ 20000						
	3000			+ .7900						
P11 = +1.7900, +.87500										
P03 = +11.0000, +.45000	120 00		P09	+ 60000				0500	0	
	X 79									
	X 005									
P07 = +1.00000, +.45000	120 00		P07	+ 2 0000					L	
	3000			+ .7900						

21 . . Program for sample part

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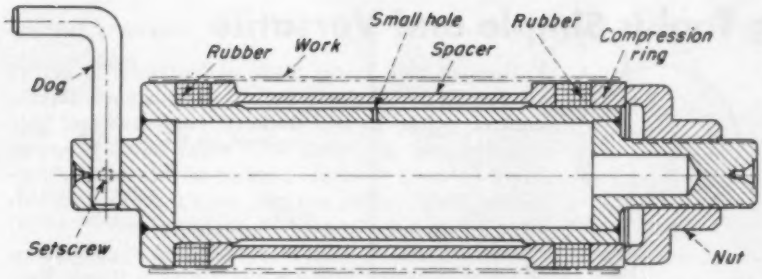


Rubber Mandrel Holds Thin-Wall Liners

The tooling idea illustrated above turned out to be the best practical solution to a tough machining problem. No trouble was encountered in boring a large batch of cylinder liners; the thickness of the castings from which they were made was adequate. The difficulty was in the OD machining.

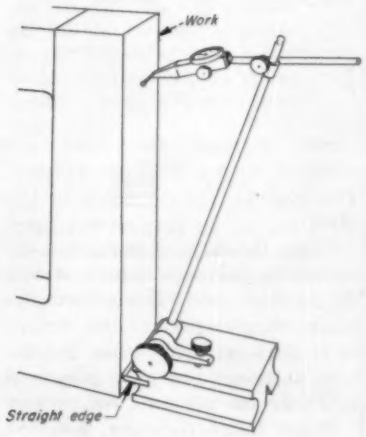
The finished wall thickness was 1/16 in. with a total tolerance of 0.001 in. for roundness and parallelism. Ordinary expanding mandrels were tried, but they caused excessive breakage because the cast iron could not withstand the tension. A remedy was neatly achieved with rubber as an expanding and clamping medium.

The body of the mandrel was fabricated from tubular stock and plugged in both ends to reduce weight. Centers were provided and a thread was cut on the extending end of one plug. The other plug was drilled for a driving dog, complete with a setscrew hole. The body was then case-hardened and ground for accuracy. A small hole was drilled into the ID before welding and heat-treating to avoid an accident.

Two synthetic-rubber rings, a spacer sleeve, and a compression ring were clamped between the shoulder of the body and a clamping nut. With the nut slightly snugged up, the entire assembly was mounted in the cylindrical grinder and finished to a diameter 0.002 in. smaller than the ID of the liner.

In operation, a liner is slipped over the mandrel and the nut is tightened to grip the liner from within. Only a little pressure is required because the rubber easily expands into the machined surface and grips well without causing distortion. The liners are finish turned at a speed of 360 sfpm with a feed of 0.008 in. per rev using carbide tools.

Alexander R Gilat, Haifa, Israel



Indicator Checks Squareness

A process constantly occurring in machine-shop practice is checking squareness. The use of a blade square or try square merely tells whether the work is square or not. It will not show how much the work is out of square, if such is the case. I have found the following method quick and easy to use in giving a direct reading of composite errors in squareness.

A standard surface gage is used as the indicator holder. A slot is ground in the front face of the base, parallel to the bottom surface. Into this slot goes a hardened steel straightedge, its length equal to the width of the base, and held in place by a slight press fit.

To determine the squareness of any given piece, two opposing faces are first made parallel. The work is then placed with one of these faces down on a good surface plate. A dial indicator is mounted on the surface gage and zeroed out against the work while the straightedge is held against the lower portion of the same face. Without disturbing the indicator setting, the workpiece is turned over.

Bringing the surface gage forward to contact the same face (now inverted), the indicator reading is noted. If this is identical to the first, the three faces checked are square with each other. If the readings vary, the difference between the two readings is twice the amount by which the piece is out of square.

Using a square of known accuracy, an indicator setting can be obtained by placing the straightedge against the base of the square. Squareness can then be checked, using this setting, without turning the part over. Methods of corrective setup are, from here on, up to the individual.

Daniel Burns, Milford, Conn

Layout Dye Shims Mandrel

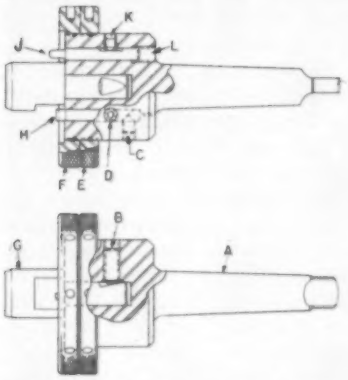
A bore is often a half thousandth or so too large for the mandrel onto which it is to be mounted. When such a situation occurs it is impossible to drive a workpiece without some sort of doctoring. Shimming is first thought of, but even the thinnest of shim stock is usually too heavy.

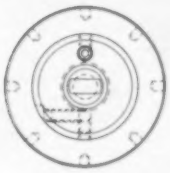
I have found that coating the arbor with layout dye will, in most cases, provide the necessary press fit to complete the job and maintain concentricity. The layout dye, when allowed to dry thoroughly, builds up the diameter with a firm hard surface that preserves concentricity without sacrifice in driving power.

D W Baumbach, Van Nuys, Calif

Practical Ideas

Grooving and Facing Tool Is Simple and Versatile





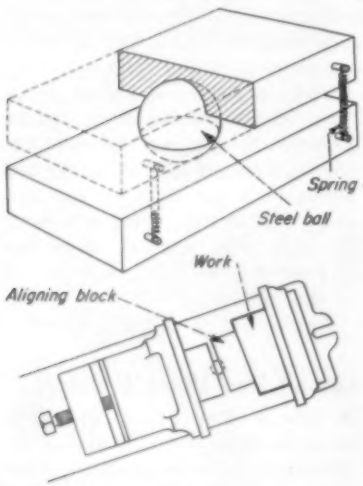
This specialized grooving and facing tool was designed to furnish independently adjustable toolbits for depth control. For short-run production, this design offers versatility as well as independent adjustments of resharpened toolbits.

Body of tool A was made of tool steel to permit hardening for toughness and wear resistance. Depth-control collar F and locking ring E were both knurled and provided with eight equally spaced blind holes on their peripheries to facilitate adjustments. Body, collar, and ring were machined to produce American Standard 16 pitch threads.

Interchangeable pilot A was secured with setscrew B which engages "whistle slot" in pilot shank. Facing tool H was ground to a 45° angle on the back end. Depth-control adjustment for this tool is accomplished by cone-point setscrew C and locked with setscrew D. Grooving tool J is adjusted from the back by setscrew L, and locked with setscrew K, which engages a flat on the side of the toolbit.

Collar, locking ring, and pilot were all made from tool steel, and were hardened and ground after machining. Toolbits were manufactured from round high-speed drill blanks.

Walter L Stein, Kenosha, Wis



Self-Aligning Block Holds Compound-Angle Parts

Most self-aligning blocks are designed to hold parts that are out of parallel, but will not work effectively on workpieces with compound angles. This was our problem recently when we had to do some milling work on parts which included a compound angle along one side.

The difficulty was easily overcome with the universal self-aligning block shown. It can be adjusted to irregular angles within its capacity (controlled by the spacing between the two halves of the block). Better gripping power can be assured by shimming with pieces of abrasive cloth between the block and the workpiece and between the block and the vise jaw.

Two pieces of CRS are required for the two halves of the block. Dimensions may vary according to requirements, but, to give an example, our blocks are ½ x 1¼ x 2½ in. A ¾-in. ball-end cutter is used to make a seat ¼-in. deep in each half for a ¾-in.-dia steel ball, which serves as the knuckle. Irregularities in the seats can be ironed out by squeezing the ball between the blocks in a press.

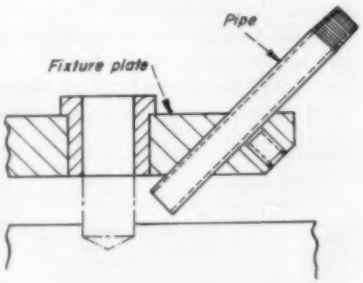
Should the work output be on a production basis, it would be best to tie the two halves and the ball together by four springs pinned to the sides. This would prevent the blocks from pulling apart.

S S Milardo, Middletown, Conn

Coolant Injection Is More Effective

During drilling and reaming operations on production runs, where heavy feeds and good finishes are required, proper application of coolant is sometimes difficult because of the drill fixtures. One way to achieve the desired result is to reduce the rate of feed, but this slows production and increases manufacturing costs.

We solved this problem by the illustrated method. A hole is drilled at an angle through the fixture plate, directed at the point of drill contact. A length of standard pipe, threaded at one end, is inserted through the hole and clamped with a headless setscrew. The coolant line connects to this pipe.



Thus, the flow of coolant is directed to the area where it will do the most good. The coolant pipe is an integral part of the fixture, so it can't get lost. When the fixture is stored the pipe goes with it, ready for the next run.

Roger Isetts, Kenosha, Wis

ARCHIE COFFMAN
Detroit, Mich

won $25 in addition to regular payment for his idea:

RADIUS FOUND WITH DOWELS

in the Aug 26, 1957 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

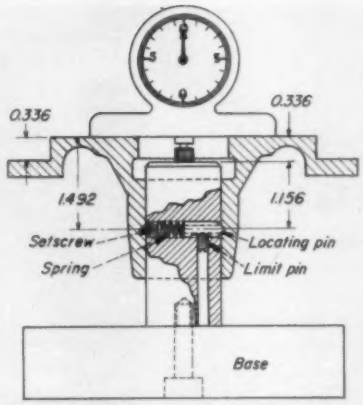
GRAND PRIZE OF $100.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.



Plug-Pin Gage Speeds Inspection

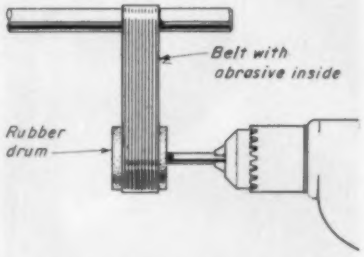
We had made several thousand parts which we later had to subject to rigid inspection. One of the critical specifications was to check the location of an internal ring groove with respect to the face of the part. This would be difficult to do without special equipment. We therefore made the illustrated holding device that not only checked this dimension but also allowed a critical 0.336-in. shoulder dimension to be inspected without additional equipment.

A plug was turned to slip-fit into the bore of the part, and both ends were faced off square with the axis. One end was tapped to be fastened to a baseplate so the plug would be held in a vertical position. A ¼-in. hole was drilled and reamed through the plug for a spring-pin assembly. Its location from the top end of the plug (which should have a ground finish) was 1.156 in., obtained by subtracting 0.336 in. from 1.492 in. We added a few thousandths to this dimension to allow some working stock on the end of the plug.

A slide-fit pin was formed at one end to a contour matching that of the ring groove. Pressure on the pin was provided by a compression spring backed up by a setscrew. Pin was restricted in its travel by another setscrew, which entered from the bottom end of the plug and engaged a flat ground on the pin.

By cutting the gaging end of the plug to an identical dimension, found elsewhere on a typical part, other gages and masters can be eliminated in many cases. We used a dial depth gage to check the distances from the face of the part to the end of the plug, as well as the identical depth of the step machined adjacent to the bore. Although we preferred a dial gage, a depth micrometer or a vernier depth gage may also be used. A beam must be used in either case to avoid faulty readings.

R G Cavaiani, Iron Mountain, Mich



Inside-Out Abrasive Belt Polishes Stationary Shaft Faster

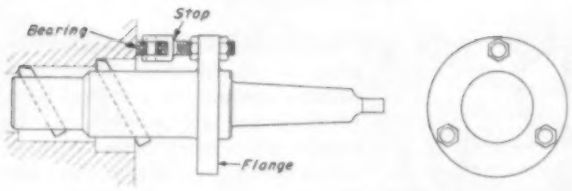
To polish a shaft in the lathe is no problem. All you have to do is to apply the proper grade of abrasive cloth to the shaft while it rotates, and you have a good finish. When the shaft cannot be rotated the story is different.

We recently had a number of shafts to polish. They were parts of components impossible to chuck in a lathe. We tried a strip of abrasive cloth, hand-held and used shoe-shine fashion, but the results were unsatisfactory and the process was slow and tedious.

An excellent finish was obtained and time was saved by using an abrasive belt turned inside out. A rubber drum, its shank chucked in a portable electric drill, supplied the power. While the drum revolved, the drill was rotated in a circle around the shaft, keeping the axis of the drill and the shaft parallel.

Warren Jones, Niagara Falls, N Y

Practical Ideas



Live Stop is Adjustable

An effective method of attaining a definite stop on a boring bar is illustrated in the above sketch. It has the advantage that it will not mar the face of the work as the tool bottoms. Although this bar was designed for use in a boring mill where depths of bores are usually difficult to control, it can just as easily be applied to production jobs in a lathe.

The bar differs from standard bars only in that it incorporates a flange for mounting the stops. Three equally spaced holes are drilled through the flange, parallel with the bar axis. These holes should be sized to allow the stops no more than a free fit.

The stops are machined from square stock. A clevis is milled in one end on each piece to take a standard ball bearing. Pressfit pins holds the bearings in place. Chucking the clevis, the remainder of the stock is turned down and threaded. Two jamnuts are used on each stop for adjustment and locking.

Roger Isetts, Kenosha, Wis

Hydraulic Dump-Truck Cylinder Gives Press A 20-Ton Wallop

The hydraulic press shown in the photo was built by us to fill a definite need in our shop. The cost of its construction represented only a part of the cost of a purchased press. The biggest saving was realized in the salvage of a discarded hydraulic cylinder which was formerly used to lift the body of a dump truck.

A strong channel-iron frame was first erected. The cylinder, mounted between the top beams, was piped to a shop-made combination reservoir and hand pump. Piping was kept simple; one line connects the pump to the cylinder with the line tapped just above the pump for the return to the reservoir.

We also installed a pressure gage on top of the cylinder. Though this is not a requisite for proper operation of the press, it definitely is a convenience.

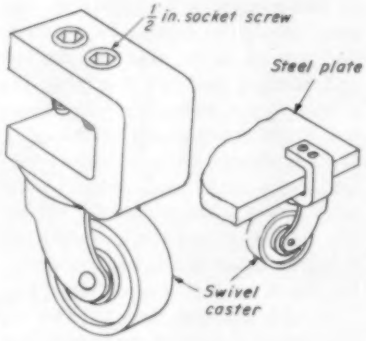
Flexibility in adjustment of the lower beams was achieved by a series of holes drilled through both angles of each upright channel iron. These holes were equally spaced, corresponding with the spacing of the bolt holes in the beams.

Harry J Miller, Sarasota, Florida

Hang on to That Chuck

To make sure you won't drop a heavy lathe chuck while you are removing it from the spindle, screw it back on a part of a turn each time you shift your hands to get a new grip. This will help you keep control of the chuck, avoiding damage to the chuck and lathe, and preventing squashed fingers.

E Mayover, Bradenton, Fla



Clamp-On Casters Ease Material Handling

In shops or plants where material and equipment must be moved, but where a regular castered truck is not suitable, a set of clamp-on swivel casters may fill the bill.

A set of four casters has been in continual use in our shop for some time, and has simplified the moving about of steel plates in particular. Loads other than plates have been handled with less effort by clamping a caster on each end of a pair of bars and using them as dollies.

The clamps are made in either of two ways. A piece of heavy flat steel can be heated and forged into a U-shape, or the same form can be machined out of a solid block. After the clamps have been shaped, two holes are drilled and tapped for the clamping screws.

Swivel casters are then welded or bolted to the underside of the clamps. A word of caution: If welding is chosen to secure the casters, care should be taken so as not to overheat the ball race or the bearing balls.

Charles Willey, Penacook, N H

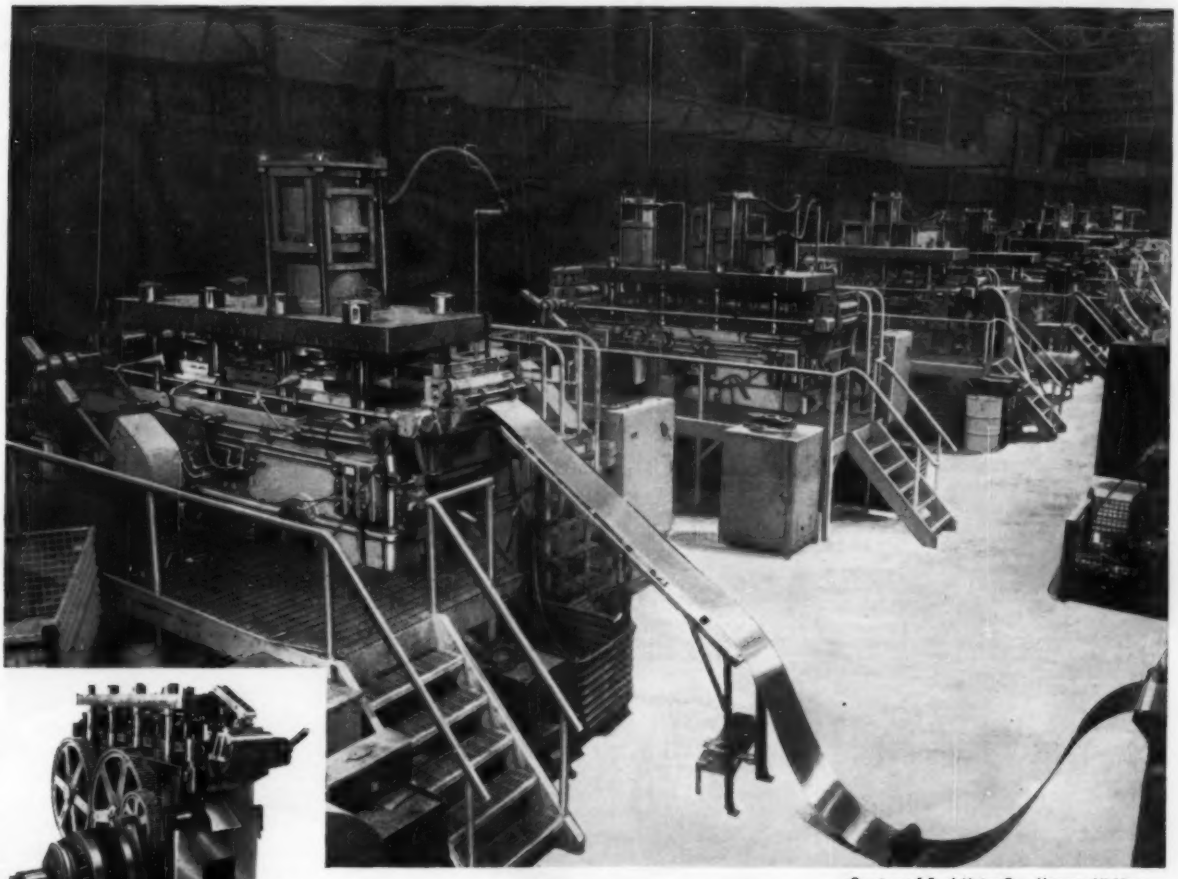
Steel Tape Subs for Micrometer

Every now and then we get a turning job that requires a micrometer of a larger capacity than we have on hand. Fortunately, these jobs are seldom of the close-tolerance variety, so our substitute is acceptable.

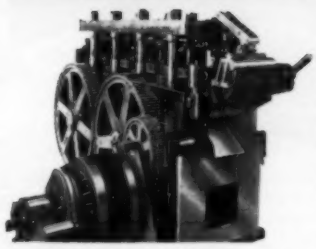
An accurate flat steel tape rule that can easily be read within 1/64 in. is used around the periphery of the work. The circumference thus found is then divided by 3.1416. By this method, the diameter error need not exceed 0.005 in.

Harold Sedlik, Manchester, Conn

Seven 300-Ton Brandes Presses at FORD Stamp Huge Runs on 12' Progressive Dies



Courtesy of Ford Motor Co., Monroe, Michigan



Rear View of one of the above Brandes 300-Ton Double Crank Presses.

Illustrated above are Brandes 300-Ton Double Crank Presses at the Ford Stamping Plant, Monroe, Michigan. These presses utilize 9-station, 12-ft. progressive dies to produce headlamp housings, hub caps, ball ring retainers at 24 to 28 strokes per minute. The tremendous length of the dies (*Brandes designed and built the first 12-ft. die*) plus the extreme accuracy of alignment built into the press give phenomenal runs between grinds. The overall height of these Brandes 300-Ton Double Crank Presses is only 9 ft. These presses are *not* installed in pits, giving greater versatility and low cost installation. Designed for versatility and proven in production for over 5 years, the installation at Ford permits continuing stamping economies with only tooling changes for new styles and models. Brandes will build your press and design your tooling to give you the greatest cost savings in progressive die stampings.

Brandes Builds Presses from 30-ton to over 4,000-ton capacity.

The BRANDES PRESS CO.

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Write for NEW SPECIFICATION Catalog

CASE HISTORY NO. 41—DIE SHARPENING

MATTISON HIGH-POWERED PRECISION

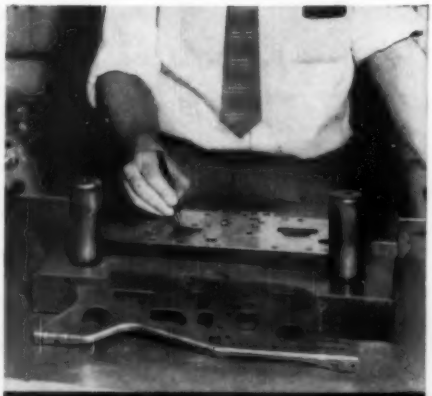
GRINDING METHODS

Courtesy: Teletype Corporation, Chicago, Illinois

Single setup sharpening of large dies cuts toolroom costs, reduces downtime

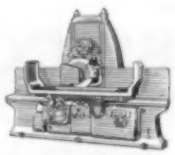
Here's how valuable production time can be saved by sharpening large dies on the Mattison High-Powered Precision Surface Grinder. In the Wrightwood plant of the Teletype Corp., Chicago, Ill., entire dies that were once sharpened section by section are now ground intact on this high-powered Mattison grinder . . . a reduction in setup time of up to 83 per cent. The wheel and spindle clearance of these Mattison machines makes it possible to sharpen the entire die without disturbing the lead pins. This means the die can go back to the press directly from the grinder, reducing press downtime.

Your Mattison dealer can arrange for a test grind of your toolroom or production parts in the Mattison Methods Laboratory . . . see him for full details.



Large blanking die is sharpened intact . . . note undisturbed lead pins. Stock removal, .005 in.; burr allowance, .002 in.

MATTISON MACHINE WORKS ROCKFORD ILL. U.S.A.



HIGH-POWERED PRECISION SURFACE GRINDERS

American Machinist REFERENCE BOOK SHEET

Miniature Screw Threads – I

A proposed American Standard that will be published by the American Society of Mechanical Engineers on acceptance

This standard introduces a new thread series to be known as National Miniature Screw Threads and intended for general-purpose fastening screws and similar uses in watches, instruments, and miniature mechanisms. The series covers a diameter range from 0.30 to 1.40 mm (0.0118 to 0.0551 in.) and thus supplements the Unified and American thread series which begins at 0.060 in. (number 0 of the machine screw series). It is comprised of a total of fourteen sizes which, together with their respective pitches, are those endorsed by the American-British-Canadian Conference as the basis for a unified standard among the inch-using countries, and coincide with the corresponding range of sizes in ISO (International Organization for Standardization) Recommendation No. 84. Additionally, it utilizes thread forms which are compatible in all significant respects with both the Unified and ISO basic thread profiles. Thus, this thread series establishes interchangeability with the corresponding sizes in both the American-British-Canadian and ISO standardization programs.

The fourteen sizes are systematically distributed, providing a uniformly proportioned selection over the entire range. They are alternately separated into two categories. The sizes shown in bold type are selections made in the interest of simplification and are those to which it is recommended that usage be confined wherever the circumstances of design permit. For more restrictive conditions the intermediate sizes shown in light type are available.

The diameter-pitch combinations have been determined to provide both maximum strength against stripping and optimum conditions for manufacture on an interchangeable basis.

Use of this series is recommended

Thread Form Formulas

Dimension	Symbol	Formula[a]
Major diameter, nominal and basic	D	
Major diameter of external thread	D_s	D
Major diameter of internal thread	D_n	$D-2h_b+2h_n=$ $D+0.072p$
Pitch diameter, basic	E	$D-2h_{ab}=$ $D-0.64952p$
Pitch diameter of external thread[b]	E_s	E
Pitch diameter of internal thread	E_n	E
Minor diameter, basic[c]	K	$D-2h_b=$ $D-1.04p$
Minor diameter of external thread	K_s	$D-2h_s=$ $D-1.20p$
Minor diameter of internal thread	K_n	K

[a] Metric units (millimeters) apply in all formulas.
[b] Only one class of thread, with no allowance on the pitch diameter, is provided.
[c] The formula given for this property is based on the modified basic thread height of 0.52p used in this standard.

Thread-Size Formulas, Basic and Design

Element	Symbol	Formula[a]
Basic Thread Form		
Angle of thread	2α	60°
Half angle of thread	α	30°
Pitch of thread	p	--
No. of threads per inch[a]	n	25.4/p
Height of sharp V thread	H	0.86603p
Addendum of basic thread	h_{ab}	0.32476p
Height of basic thread (Unified and ISO)[b]	h_b	0.54127p
Height of basic thread (this standard)	h_b	0.52p
Design Form - External Thread		
Addendum	h_{as}	0.32476p
Height	h_s	0.60p
Flat at crest	F_{cs}	0.125p
Radius at root	r_{rs}	0.158p (approx.)
Design Form - Internal Thread		
Height of engagement	h_e	0.52p (=h_b)
Height of thread	h_n	0.556p
Flat at crest	F_{cn}	0.27456p
Radius at root	r_{rn}	0.072p (approx.)

[a] Metric units (millimeters) apply in all formulas.
[b] This item listed for reference only. For the present standard all dependent details of thread form and dimensions are based on a height of 0.52p.

10"-1" Collet Precision Toolroom Lathe Prices start at $1628

10"-1" Collet Bench Engine Lathe Prices Start at $1319

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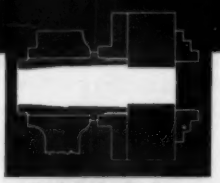
Accuracy that's a match for any job . . . and any tolerances.
Speed and handling ease for high output.
Versatility for more jobs with less effort.
Efficient machining that will hold down your costs.
Optional features include Cam Lock Spindles, Long Taper Key Drive Spindles and Hardened and Ground Bed Ways for utility and service.



1⅛" Spindle Bore

1" Collet Capacity

Send for Free Catalog

Describes 9" to 16-24" Engine Lathes, 9" to 16" Toolroom Lathes, Turret Lathes, Milling Machines, 7" Shapers, 14" Drill Presses, Pedestal Grinders, Attachments.

SPECIFICATIONS

Swing . . . 10¼" over bed and saddle wings.
Distances between centers . . . 14" to 34"
Collet capacity . . . 1" max.
Spindle hole . . . 1⅛"
Spindle speeds . . . 12 or 24, 27 to 1400 r.p.m.
Longitudinal feeds . . . 70 R.H. or L.H.
Cross feeds . . . 70
Thread cutting range . . . 70 R.H. or L.H. pitches—4 to 480 per in.

SOUTH BEND PAYMENT PLAN
Up to 24 months to pay.

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BUILDING BETTER TOOLS SINCE 1906
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American Machinist REFERENCE BOOK SHEET

Miniature Screw Threads – II

on all new products in place of the many improvised and unsystematized sizes now in existence which have never achieved broad acceptance nor recognition by any standardization bodies.

SPECIFICATIONS

Basic Form of Thread. The theoretical profile on which the design forms of the threads covered by this standard are based is, except for one element, the Unified and American basic thread form as presented in ASA B1.1-1956. An exception is thread height, for which a basic value of 0.52_p is used instead of 0.54127_p ($= 5\ H/8$). Selection of this value is based solely on the extensive simplification which it affords throughout the calculations for this standard. Resulting coefficients in the formulas for many of the other thread dimensions derived from this property thereby become simple, finite multiples of the lowest common denominator (40) of the fractional equivalents of all but two of the metric pitches, thus yielding value for the majority of metric dimensions that are finite within the decimal place limits of the tables. Also, the calculations of inch equivalents from the terminal metric values are thereby simplified and discrepancies between the metric and inch tables kept to a minimum. This modification will not affect interchangeability with products made to any other standards retaining 0.54127p, since the resulting difference is negligible and completely offset by practical considerations in tapping, full internal thread heights being invariably avoided in these small sizes to escape excessive tap breakage.

Design Forms of Threads. The design forms (maximum material condition) of the external and internal threads are shown in Fig. 1. Formulas for the various dimensions are also listed.

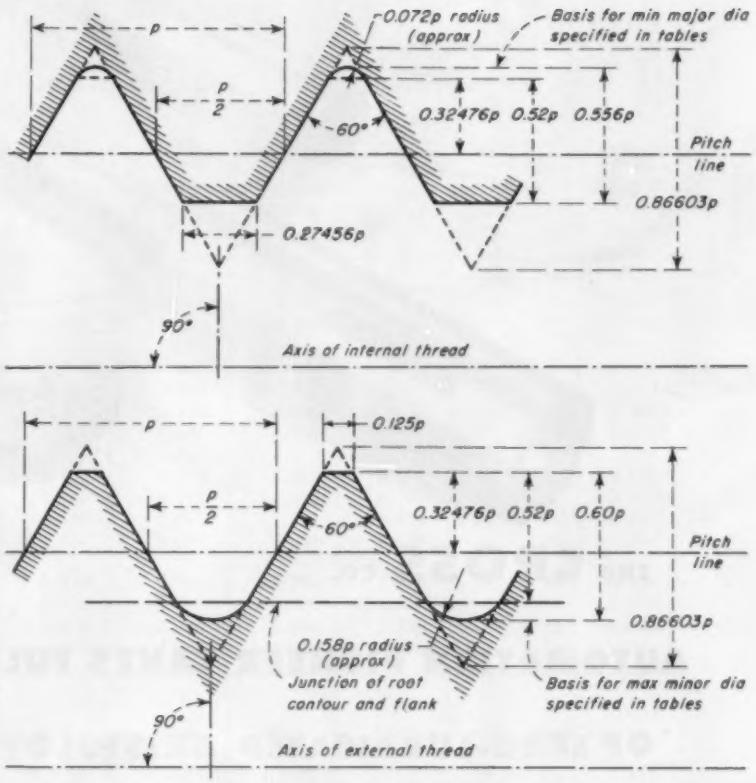
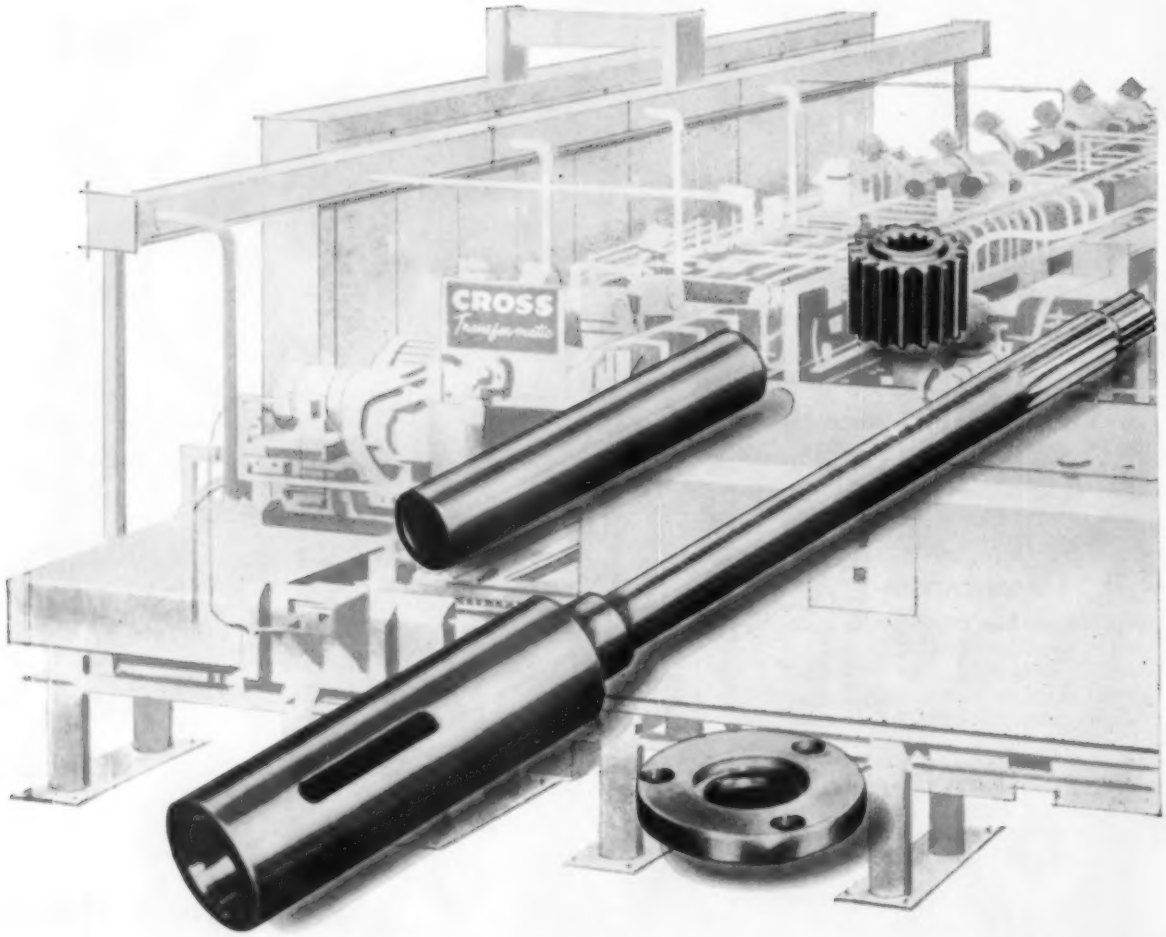


Fig. 1 – Design (maximum material) thread forms

Nominal Sizes. The thread sizes comprising this series and their respective pitches are shown in columns 3 and 2, respectively, of the table on page 167.

Classifications. There is established herein only one class of thread, with zero allowance on all diameters, in view of the difficulties which any differentiations in tolerances would impose on manufacture and no demonstrated need for additional classes.

Designation. The screw threads of this series shall be designated on engineering drawings, in specifications, and on tools and gages (when space permits) by their nominal diameters in hundredths of a millimeter followed by the symbol "NM", as shown in the first column of the table on page 167. To these designations may be affixed, in parentheses, the inch equivalent of the basic major diameter, but this addition is optional. Thus, for example, the thread size identified by the designation 80 NM may also be designated 80 NM (0.0315).



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In operations performed on drill spindles and drill spindle gears, the manufacturer of Transfer-matic equipment noted a remarkable improvement in tool life. A change from 6150 to leaded Aristoloy 6150 increased tool life six times on turning operations and tripled it on reaming.

Turning speeds could be stepped up from 250 to 340 S.F.M. and feed was upped from .010 to .015 I.P.R.

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American Machinist REFERENCE BOOK SHEET

Miniature Screw Threads – III

Thread-Size Dimensions, Basic and Design

Size Designation[a]	Pitch p	Basic Major Diameter D	Basic Pitch Diameter E	Basic Minor Diameter K	Minor Diameter External Threads K_e	Major Diameter Internal Threads D_n	Lead Angle at Basic Pitch Diameter λ		Sectional Area at Minor diameter at D-1.28p
	mm	mm	mm	mm	mm	mm	deg	min	sq mm
30 NM	**0.080**	**0.300**	**0.248**	**0.217**	**0.204**	**0.306**	5	52	**0.0307**
35 NM	0.090	0.350	0.292	0.256	0.242	0.356	5	37	0.0433
40 NM	**0.100**	**0.400**	**0.335**	**0.296**	**0.280**	**0.407**	5	26	**0.0581**
45 NM	0.100	0.450	0.385	0.346	0.330	0.457	4	44	0.0814
50 NM	**0.125**	**0.500**	**0.419**	**0.370**	**0.350**	**0.509**	5	26	**0.0908**
55 NM	0.125	0.550	0.469	0.420	0.400	0.559	4	51	0.1195
60 NM	**0.150**	**0.600**	**0.503**	**0.444**	**0.420**	**0.611**	5	26	**0.1307**
70 NM	0.175	0.700	0.586	0.518	0.490	0.713	5	26	0.1780
80 NM	**0.200**	**0.800**	**0.670**	**0.592**	**0.560**	**0.814**	5	26	**0.232**
90 NM	0.225	0.900	0.754	0.666	0.630	0.916	5	26	0.294
100 NM	**0.250**	**1.000**	**0.838**	**0.740**	**0.700**	**1.018**	5	26	**0.363**
110 NM	0.250	1.100	0.938	0.840	0.800	1.118	4	51	0.478
120 NM	**0.250**	**1.200**	**1.038**	**0.940**	**0.900**	**1.218**	4	23	**0.608**
140 NM	0.300	1.400	1.205	1.088	1.040	1.422	4	32	0.811
	Threads per inch	inch	inch	inch	inch	inch	deg	min	sq in x 10 $^{-4}$
30 NM	**318**	**0.0118**	**0.0098**	**0.0085**	**0.0080**	**0.0120**	5	52	**0.475**
35 NM	282	0.0138	0.0115	0.0101	0.0095	0.0140	5	37	0.671
40 NM	**254**	**0.0157**	**0.0132**	**0.0117**	**0.0110**	**0.0160**	5	26	**0.901**
45 NM	254	0.0177	0.0152	0.0136	0.0130	0.0180	4	44	1.262
50 NM	**203**	**0.0197**	**0.0165**	**0.0146**	**0.0138**	**0.0200**	5	26	**1.407**
55 NM	203	0.0217	0.0185	0.0165	0.0157	0.0220	4	51	1.852
60 NM	**169**	**0.0236**	**0.0198**	**0.0175**	**0.0165**	**0.0240**	5	26	**2.03**
70 NM	145	0.0276	0.0231	0.0204	0.0193	0.0281	5	26	2.76
80 NM	**127**	**0.0315**	**0.0264**	**0.0233**	**0.0220**	**0.0321**	5	26	**3.60**
90 NM	113	0.0354	0.0297	0.0262	0.0248	0.0361	5	26	4.56
100 NM	**102**	**0.0394**	**0.0330**	**0.0291**	**0.0276**	**0.0401**	5	26	**5.63**
110 NM	102	0.0433	0.0369	0.0331	0.0315	0.0440	4	51	7.41
120 NM	**102**	**0.0472**	**0.0409**	**0.0370**	**0.0354**	**0.0480**	4	23	**9.43**
140 NM	85	0.0551	0.0474	0.0428	0.0409	0.0560	4	32	12.57

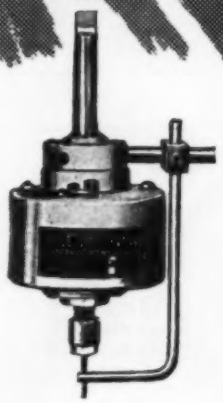
[a]Sizes shown in bold type are preferred. It is recommended that selections be confined to these sizes insofar as possible.

ERRINGTON TAPPERS . . .
the COMPLETE LINE . . .
the LEADING LINE SINCE 1891

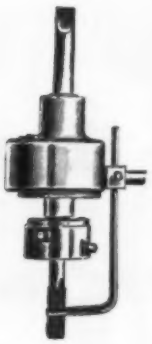
FRICTION
For blind holes, tapping in steel, copper, etc. wherever there is danger of breaking taps.

Errington specializes in the manufacture of high speed multiple drilling and tapping attachments. The name Errington is your assurance of top-quality products . . . your assurance of the finest and most modern tools to produce first-grade workmanship at minimum operating costs.

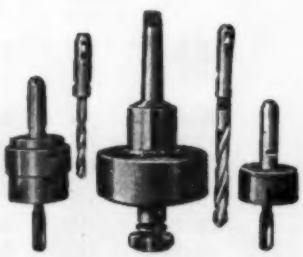
Write for Complete Information



BALL BEARING CONE-DRIVE
Designed for Ball Bearing High Speed Drill Press.



POSITIVE
For through holes where work is drilled and then re-handled and tapped.



QUICK-CHANGE
Tool-Holders to Drill, Tap and Set Studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tap-holder, if required.

These Tappers may also be adapted for button or acorn die threading.

ERRINGTON MECHANICAL LABORATORY, Inc.
Established 1891
Main Office and Plant: **STATEN ISLAND 4, NEW YORK**

Talking Shop...

Glued Labels

IDENTIFICATION or instruction plates are often attached to metal housings by screws or rivets. On shipboard, when a label must be attached to a waterwater- or oil-tight bulkhead, it is necessary to weld a backing plate to the bulkhead to which the label can be fastened. A series of cost studies made by one organization with this problem, shows that the cost per label averages $4.00 when a backing plate is required, $2.85 when direct attachment is possible. These costs are cut to $1.16 when the label is attached with adhesive. The adhesive used is Plymaster V-2, a fibrous glass mat impregnated with a polyester resin. The adhesive mat is applied to the back of the label and cut to size. When ready for installation, the protective paper is removed from the mat and an activator, such as methyl ethyl ketone, is brushed on. It is only necessary to hold the label in place by hand pressure for one minute for adhesion to take place.

Hidden Short Mystery

ONE OF THE LARGE TV set manufacturers recently went through a frustrating experience in quality control. A high percentage of sets were being returned from dealers with short circuits. When engineers checked back through the records, each of these sets was found to have passed final test as OK. Studies were made. Sets were given special tests, shipped to the dealers, and had short circuits when they arrived. Finally an engineer went out in the shipping room to see if anything could possibly happen there that did the damage.

All they did in the shipping room was paste a label inside the cabinet. This was done by applying adhesive to the label and slapping it on the inside of the cabinet. Sure enough, the adhesive, some of which dripped from the label, was a conductor. Presto! A change to an adhesive that is a non-conductor has solved this particular production headache.

Engineered Confusion

AN ORGANIZATION CHART of the engineering profession "would be a good organization for a rabbit warren inhabited exclusively by two-headed rabbits," charged William F Ryan, president of ASME, at the fall meeting of that society. Dr. Ryan was making a plea for a survey of the engineering profession, as proposed by the Engineers Joint Council. In contrast with the confusion of engineering organizations, he thinks that an organization chart of the medical profession, is "so logical and efficient that one would suppose it had been designed by engineers."

Plating Solution

WHEN TROUBLE ARISES in zinc or cadmium plating, the finger is usually pointed at the addition agent. According to chemical engineers at Wagner Brothers it usually turns out to be an out-of-balance bath. They say that putting in more additive is like dropping pennies in a wishing well. To avoid trouble, you must add cyanide and caustic soda either daily or twice a week, depending on the production schedule. Additives are fine, they say, to produce a bright or mat finish, to affect the grain structure of the plate, or to change corrosion resistance, but not to correct the basic plating bath.

Metal With Two Names

ONE OF THE METALS enjoys the doubtful distinction of having two names. It is No. 41—columbium and niobium. Here in the United States the impression exists that niobium is a *new* name for the element, but the truth is that both names are rather old. The element was first discovered in a New England ore (authorities differ on whether it was Connecticut or Massachusetts) by Charles Hackett in 1801 and *he* named it *columbium*. Then in 1844 the metal was isolated by Heinrich Rose in Bavaria, and *he* named it *niobium*. The element has gone by both names ever since, usually being called columbium in the United States and niobium in Germany. Rose chose the name niobium from Niobe, the mythological daughter of Tantalus, because the new metal was found with tantalum. In recent years the niobium name has gained favor in the US.

A few weeks ago Westinghouse Research Labs announced a method to prepare high-purity niobium on a scale large enough to study structural applications. It seems that niobium may be useful at temperatures above 1800 F, above the range of most present super-alloys. Coatings to protect the metal from oxidation up to 2500 F are the goal of a new study at Horizons, Inc. Both research programs are sponsored by the Wright Air Development Center.

NEWS REPORT

What's Ahead in Capital Spending?

NEW YORK—"How much will you spend for new equipment between now (September '57) and the end of 1958?"

A total of 852 companies answered this question in a recent American Machinist survey by estimating total expenditures of more than $105 million for machine tools and presses. More than $35 million will be spent for other production equipment—including welding, heating, inspection, and handling equipment—during this 16-month period.

Covering about 10% of Metalworking, this survey made in August reveals that 67% of the companies giving expenditure estimates will place orders for machine tools within this period. 25% will order forming or forging equipment. These 852 companies will spend an average of $124,000 per plant for machine tools and presses, or $157 per worker.

At the same time, 64% of the companies plan to order other production equipment at an average rate of $42,100 per company and $53 per worker.

(The machine-tool figures are not directly comparable to the new-orders index of the National Machine Tool Builders Association, because they include punches, shears, presses, other metal-forming equipment not in the NMTBA Index.)

$1 Billion by 1958's End?

These statistics, projected across all Metalworking, indicate that approximately **one billion dollars** will be spent during this 16-month period for machine tools, presses, and other production equipment.

This estimate makes allowance for the fact that expenditures given by reporting companies are possibly higher than average. It is logical that any company with definite expansion plans would be more likely to report these plans than a company whose plans are less positive.

Results of this survey seem to agree with other indications that industry spending will be somewhat lower in 1958 than in recent peak years, especially in certain segments of Metalworking. However, the statistics do give the lie to predictions that an across-the-board recession will strike industry during the coming year. Actually, expenditures by many Metalworking industries will be at least as high in 1958 as in recent years.

Too, the argument that figures given by reporting companies are higher than average is counterbalanced by the fact that many key companies stated "Don't know" in response to the survey's questions on future spending. Obviously these companies will place orders for a certain amount of equipment—the larger companies will order a considerable amount—before the end of 1958. That these orders are not reflected in the survey is another indication of the cautiousness with which certain segments of Metalworking are facing the immediate future.

There is reason to believe that spending by automobile manufacturers and builders of office and store machines will be considerably less than, say, in 1956 or 1957; on the other hand, builders of electrical equipment and fabricated metal products will spend as much or even more for new equipment in 1958 as in the past few years.

Nature of the Survey

Data in this report is based on questionnaires mailed to a representative cross-section of metalworking companies in fourteen general industries. Approximately 25% of the companies solicited returned filled-out surveys.

Part of the information requested was compiled and issued as a Special Report, "The Impact of Automation" (SR 451, *AM*—Oct 21, '57, pp 165-180).

About 11% of the companies replying could not yet estimate the dollar value of their plans. Dollar information given here is based on 852 companies that indicated plans, a total that includes those companies that plan no purchases. Criterion here was that if a company indicated its plans for any expenditure in any category—machine tools, presses, or other production equipment—either positively or negatively, it would be included in the survey.

Companies responding to the survey were distributed throughout five employee size groups, with a total of approximately 675,000 employees distributed in the following manner:

Employees	% Companies in Survey
Over 1000	10%
500 - 999	7
100 - 499	30
50 - 99	23
1 - 49	30

The breakdown by employee size groups in Table I shows that a greater percentage of large companies, as might be expected, will invest in new equipment than smaller organizations. But even the smallest companies—those with 1-49 employees—are planning to make sizable investments. Some 58%—a percentage not too far below the over-all percentage of 67%—plan to place orders for machine tools before the end of 1958. And although only a few of these smallest companies plan to invest in forming and forging equipment, almost half will be buying such equipment as portable tools, industrial trucks, and welding and inspection equipment.

A more direct comparison of your company's plans and those of your competitors can be made in Table 2, which shows the plans of fourteen types of industries. Although half the companies (in terms of employees) in the automotive industries reported their spending plans, only 53% plan to invest in new machine tools—a clear indication that spending in this industry will not be so high as in recent years. In the same sense, builders of office and store machines (23% reporting) and precision mechanisms (14% reporting) apparently are planning to invest less heavily than in the past.

Spending in the aircraft industry (2% reported) reflects only purchases planned by the industry itself, and does not include equipment to be purchased by the Government. The indication here that this industry intends to spend almost three times as much money for other production equipment as for machine tools and presses is significant.

Many industries, in contrast to those mentioned above, apparently are planning to spend as much money during 1958 as they have been doing for the past few years. The survey shows that makers of electrical equipment should spend slight-

852 Metalworking Firms Report Plans

1. PLANNED EXPENDITURE OF 852 COMPANIES BY SIZE

SIZE OF COMPANY	COMPANIES ESTIMATING EXPENDITURE	MACHINE TOOLS (cutting and forming) PERCENT PLANNING PURCHASES CUTTING	FORMING	PLANNED EXPENDITURE SEP/57-DEC/58	OTHER PRODUCTION EQUIPMENT PERCENT PLANNING PURCHASES	PLANNED EXPENDITURE SEP/57-DEC/58
1000 employees and over	83	87	58	$70,250,100	88	$26,462,400
500-999 employees	63	81	36	9,373,000	90	4,142,250
100-499 employees	256	73	24	17,364,600	68	3,626,050
50- 99 employees	196	65	29	4,591,000	67	1,202,500
1- 49 employees	254	58	8	3,688,100	45	445,000
TOTAL	852	67	25	$105,266,800	64	$35,878,200

2. PLANNED EXPENDITURE OF 852 COMPANIES BY INDUSTRY

INDUSTRY	APPROXIMATE PERCENT OF INDUSTRY REPORTING	MACHINE TOOLS (cutting and forming) PERCENT PLANNING PURCHASES CUTTING	FORMING	PLANNED EXPENDITURE SEP/57-DEC/58	OTHER PRODUCTION EQUIPMENT PERCENT PLANNING PURCHASES	PLANNED EXPENDITURE SEP/57-DEC/58
Agricultural Machinery	2	52	17	$1,575,000	70	$291,500
Construction, Mining, Oil-Well Equip	19	80	21	5,912,500	75	1,379,600
Metalworking Machinery	16	80	9	15,722,350	53	2,123,000
Special Industry Machinery	9	68	9	6,102,500	51	602,000
General Industrial Equipment	10	81	19	8,072,250	66	749,700
Office & Store Machines	23	82	27	1,392,000	55	417,700
Domestic & Service Equipment	5	53	12	845,100	65	664,000
Electrical Equipment	2	72	34	2,323,250	72	619,000
Misc Machine Parts & Jobbing	4	82	13	4,730,000	54	1,048,750
Motor Vehicles & Parts	49	53	37	35,760,300	73	18,205,200
Aircraft & Parts	3	67	33	1,334,000	73	3,396,000
Fabricated Metal Products	4	55	48	14,129,700	68	3,549,650
Railroad, Shipbuilding, & Misc	3	60	19	4,960,750	69	2,363,600
Precision Mechanisms	14	74	39	2,407,100	56	468,500
TOTAL	10	67	25	$105,266,800	64	$35,878,200

NOTE: 11% of the companies who participated in the survey did not indicate how much they will spend. Percent of each industry reporting is based on the other 89%. Percent planning purchases is that portion giving an actual dollar expenditure.

3. AVERAGE EXPENDITURE PER COMPANY BY SIZE

SIZE OF COMPANY	MACHINE TOOLS (cutting and forming)		OTHER PRODUCTION EQUIPMENT	
	PER COMPANY	PER EMPLOYEE	PER COMPANY	PER EMPLOYEE
1000 employees and over	$846,000	$126	$319,000	$48
500-999 employees	149,000	226	65,700	100
100-499 employees	67,800	352	14,200	74
50- 99 employees	23,400	350	6,130	92
1- 49 employees	14,500	497	1,750	60
AVERAGE ALL PLANTS	$124,000	$157	$42,100	$53

4. AVERAGE EXPENDITURE PER COMPANY BY INDUSTRY

INDUSTRY	MACHINE TOOLS (cutting and forming)		OTHER PRODUCTION		AVERAGE SIZE OF PLANT
	PER PLANT	PER EMPLOYEE	PER PLANT	PER EMPLOYEE	
Agricultural Machinery	$68,500	$557	$12,700	$103	123
Construction, Mining, Oil-Well Equip	121,000	313	28,100	73	385
Metalworking Machinery	105,000	347	14,200	47	310
Special Industry Machinery	80,400	390	7,900	39	206
General Industrial Equipment	110,500	328	10,300	31	337
Office and Store Machines	127,000	50	38,000	15	2,540
Domestic and Service Equip	49,800	68	39,000	53	737
Electrical Equip	38,100	106	10,100	28	360
Misc Machine Parts and Jobbing	121,300	363	26,900	80	334
Motor Vehicles and Parts	1,193,000	103	607,000	53	11,500
Aircraft and Parts	89,000	64	226,000	162	1,400
Fabricated Metal Products	64,800	222	16,300	55	294
Railroad, Shipbuilding, and Misc	74,100	236	35,200	112	315
Precision Mechanisms	104,500	59	20,300	12	1,770
AVERAGE, ALL PLANTS	$124,000	$157	$42,100	$53	786

ly more in 1958 for new equipment than in 1957. This condition also appears to hold true for manufacturers of fabricated metal products. In several other industries—notably agricultural machinery, special-industry machinery, general industrial machinery, and railroad and shipbuilding equipment—spending will be consistent with levels attained in the past.

Investment per Plant/Employee

Tables 3 and 4 show average estimated expenditures per company by size and by industry, as well as expenditures per employee by size and by industry. Figures in these tables, which are more significant in many ways than the data that appears in Tables 1 and 2, were also derived from information furnished by 852 companies on their future spending plans.

If all of Metalworking is considered, the results show that companies with more than 1000 employees plan to spend an average of almost $1.2 million for new equipment during the 16-month period between Sep '57 and Dec '58. The smallest plants will spend an average of more than $15,000 during the same period. Average for all plants is $124,000 for machine tools and presses and $42,100 for other production equipment, or roughly $166,000 in all.

Figures for investment per employee show that the smaller the plant, the greater the investment. It is logical to assume that the smaller the company, the greater the percentage it must spend to keep even with larger companies. Incidentally, the relatively small investment per employee in companies with more than 1000 employees is another indication that the really big companies are tending—at least as of the moment of the survey—to be cautious about announcing their plans for 1958.

The data given in Table 4 corroborates the information obtained from previous tables, and points out more explicitly the pattern of spending in the various industries. What is happening here is a shifting (compared to past spending records) of expenditures, so that some industries which in the past have spent less, percentage-wise, than others will be spending more in 1958. The top five machine-tool buyers, in terms of dollars per employee, according to the survey, are agricultural machinery,

special-industry machinery, miscellaneous machine parts and jobbing, general-industrial equipment, and metalworking machinery. If this rating is not a valid one when expanded to include all of Metalworking, it at least is another strong indication that spending will be down in some industries, maintained at the same level as in the past in others.

The survey indicates that approximately 4500 machine tools and presses will be purchased by the 852 companies, with lathes, drilling machines, special machines, and milling machines being purchased in greatest quantity.

Almost two out of every three companies in all employee size groups plan to purchase other production equipment next year. Percent planning purchases ranges from roughly 90% in companies with more than 500 employees to 45% in those with less than 50 employees. Greatest amounts will be spent on portable tools, welding equipment, and inspection equipment.

The proof of any survey is in the pudding, which in this instance cannot be eaten before the end of 1958. The reader is cautioned against expanding the data given too literally, either objectively or in accordance with what he has read in this morning's newspaper. This information does indicate, however, certain trends in industry that appear fairly definite:

- Industry spending will be selective during 1958. It won't be a record year, but on the other hand it won't be a "bust." Many companies have provided objective information that they intend to buy new equipment in sizable quantities.
- Certain industries, which in the past few years have accounted for large percentages of metalworking expenditures, are not planning to spend as much in 1958 as in the years immediately preceding.
- Spending plans for some large companies are down. Because many large companies are not at present certain about their spending for 1958, they are not committing themselves to estimates.
- Production rates have remained high in most industries, and people have the money to buy. Most concern centers around new orders. All these factors point to strong competition for the new business that develops.

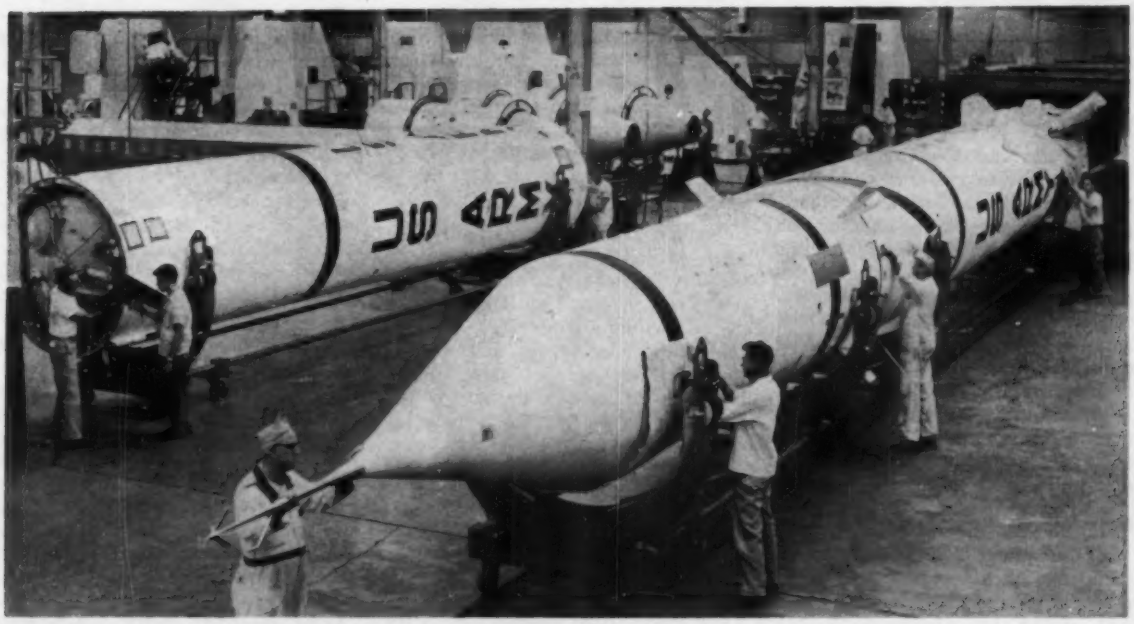
GE's Man-Made Diamonds Go on the Market

DETROIT — General Electric Co's man-made diamonds, which were greeted with such fanfare in the press last February, are now for sale. More than 100,000 carats have already been turned out by a pilot plant here, and by 1957's end, GE predicts, a "substantial quantity of them" will be in use on grinding wheels for sharpening carbide-cutting tools and in other industrial applications.

$4.25 per Carat

The price? At the moment it's $4.25 per carat, compared with about $2.55 per carat for ungraded natural diamonds, but with improved production techniques, the price should come down gradually. Grain sizes now available range from 60-600. Larger sizes will come later.

The supply? Virtually unlimited, according to GE, which claims this development could possibly free the U S from dependence upon industrial diamond suppliers in Africa. But such large-scale output would only come in a national emergency.



Readying the Redstone for Shipment

Army's Redstone guided missiles get a final going over on one of the assembly lines at Chrysler Corp, Detroit, just prior to shipment to a test site in Florida. The 63-ft-long missiles are disassembled into two parts for shipment (power plant and fuel tanks, 34 ft long; and control system and warhead, 29 ft long) so that they can be trucked to combat areas or flown by cargo plane to launching sites in remote areas

NEW NMTBA PRESIDENT
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Overdue Replacement Will Bulwark US

FRENCH LICK IND—Existence of an enormous potential replacement market for machine tools.

Concern over mounting imports of machine tools into the U S domestic markets.

Merits of selling machine tools direct or through distributors.

These were among the topics discussed at the 56th Annual Meeting of the National Machine Tool Builders' Association at the French Lick Sheraton Hotel October 23-25.

Three Keys to Future

The machine tool industry can look into the future with confidence for three reasons, Jerome A Raterman, president of the Association and president of Monarch Machine Tool Co, declared. First is the replacement market as revealed by estimates of *American Machinist*. These estimates are that currently 68% of metalcutting machine tools and 65% of metalforming machine tools are 10 years old or older, and 17% of metal-cutting types and 35% of metalforming types are over 20 years old.

R&D Speeds Replacement

Mr Raterman cited the future demand for machine tools for delayed plant expansion projects as the second reason for confidence in the future. The third reason is the rapid rate of research and product development within the machine tool industry—that will make machines that are good enough today not good enough tomorrow.

With the machine tool industry committed to a Show in 1960, another in 1965, and still another in 1970, builders must gear themselves to a production of new and improved models every five years. Mr Raterman stressed that with the 1960 show less than three years away, it is imperative that design work on new models be under way right now. He pointed out that in the nine months following the 1955 show the machine tool industry booked net new orders of $883 millions.

$800 Million Shipments in '57

Machine tool shipments this year should be at least $800 million, Mr Raterman predicted. This figure has been exceeded in only four out of the last 13 years. And three of those four years reflected national defense needs stemming from Korea.

Mr Raterman expressed the view that the amount of new orders booked this year could be a lot worse, especially if the volume is compared with seven post war years during which the industry had practically no carryover from defense emergencies. He brought out the fact that the industry's record of earnings and dividends is one of remarkable stability.

Foreign Market a Problem

The government owns today about 15% of all machine tools in the country, Mr Raterman said. For the first six months of this year, rated shipments amounted to 11% of production. As to exports, they now represent around 10% of output against a former average of 20% because of increased sales prices, import restrictions by foreign nations, special taxes, and nationalistic preferential regulations that have encouraged European machine tool production at our expense.

Mr Raterman expressed his conviction that U S builders should be allowed to go into foreign markets on the same basis that foreign builders are permitted to enter the U S market. This, he remarked, poses a problem for the State and Commerce Departments.

Nuclear war mobilization requirements for some kinds and types of critical machine tools are expected to exceed industry capacity to produce, Niels A Olsen, Acting Director of the Metalworking Equipment Division, Business & Defense Services Administration, told Association members. Long lead-time machine tools become even more critical under nuclear war concepts. It may be necessary for BDSA to call together a task force for advice in preparing a report on the Elephant Tool Program to the Director of Defense Mobilization even before the new requirements have been fully determined.

M-Day Pool Orders

Mr Olsen said that almost all contracts involved in the first phase of the M-Day Machine Tool Trigger (pool order) Program have been signed. The Program covers 91 sched-

SECRETARY (reelected)
Walter K Bailey
President
Warner & Swasey Co
Cleveland

DIRECTOR
Julian C Pease
Executive Vice President
New Britain Machine Co
New Britain, Conn

DIRECTOR
Graham E Marx
Vice President and General Manager
G A Gray Co
Cincinnati

Machine Tool Market, NMTBA Told

ules "A" for about 15,000 general purpose, metal-cutting machine tools valued at $230 million. Further phases of the program will include elephant-type machines, forming and shaping machines, and possibly additional metal-cutting machines.

Out of 112 pool order contracts covering 94,225 machine tools valued at $1.4 billion in the Korean program, Mr Olsen pointed out that only 222 machines worth $3.4 million, remain unsold—1/3 of 1 percent of the government's liability. BDSA expects to close out this program within six months.

About 4000 surplus government-owned machine tools have been sold the past year and not more than that number will be disposed of the coming year, Mr Olsen declared.

BDSA's Metalworking Equipment Division is now extending its activities, he revealed, to provide industry with specific economic and statistical information obtainable only by the government. This information will aid industry in formulating plans and programs.

Arrangements have been made for an advisory group of the Internal Revenue Department to meet with representatives of machine tool builders to discuss the need for a more realistic depreciation policy, Swan E Bergstrom, chairman Government Relations Committee, and executive vice president of Cincinnati Milling Machine Co, reported. A statement outlining the Association's recommendations on depreciation policy for machine tools has already been filed with the Treasury Department.

New ODM Rental Policy

ODM's recent policy statement has helped to clarify the question of rentals of government machine tools to other than defense contractors, Mr Bergstrom commented. The new policy makes possible much better control over government owned facilities. There is a strong feeling among the Services that a sound replacement policy should be applied to modernization of government as well as private machine tool facilities. We cannot allow our arsenals and shipyards to go by default because of obsolescence, he observed.

Regulation of Imports?

The intake of foreign-built machine tools should be regulated by some means, Mr Bergstrom said, in order to protect the machine tool industry, which affects our economic and national security. Increasing the tariff will not stop these imports. The only feasible way is to resort to the same means of control used by other Free World nations. If something along this line is not done, domestic markets of U S builders will be endangered. For further discussion of this subject, turn to page 105.

Of special interest to members was a lively panel discussion on selling through distributors and by direct methods. Kenneth M Allen, executive vice president of the Rockford Machine Tool Co, and Ralph J Kraut, president, Giddings & Lewis Machine Tool Co, gave their views on selling through distributors. Walter K Bailey, president of Warner and Swasey Co, and Frank U Hayes, vice president and assistant general manager, Bullard Co, supported the direct selling technique. Frederick S Blackall, Jr, president and treasurer, Taft-Peirce Mfg Co, was the moderator.

Cost-Cutting Will Count

Nineteen fifty-eight will be a year made to order for producers of equipment with real cost-cutting capacity, Dexter M Keezer, vice president and director of the economics department of the McGraw-Hill Publishing Co, said. "Caught between a fierce struggle for markets and higher labor costs, alert company managements will be more eager than ever to get cost-cutting equipment. And they will have the money to buy it too."

American industry will spend more money for research and development in 1958 than in any year in its history, he pointed out. The flood of new products, new processes and equipment spawned by the tremendous volume of research and development gives assurance that the dip in business investment in new producing facilities next year will be relatively brief.

"The availability of ample capacity to produce most everything," Mr Keezer emphasized, "will be a key contributor to making 1958 by all odds the most competitive year for industry since the end of WW II."

Magnesium People Talk Joining Methods

NEW YORK—In welding magnesium, the consumable electrode method has a three-to-one advantage over the tungsten arc method in shop costs, according to Ray Miles, President of Copperloy Corp, Cleveland. In addition to speed, the process provides greater weld penetration. And the speed itself results in less heat concentration, therefore fewer warpage and alignment problems.

In a paper presented at the Magnesium Association's two-day convention here, October 17 and 18, Mr Miles also discussed the problem of "burn backs" but claimed that a new Copperloy-patented device has virtually eliminated this difficulty. Details of the development will not be released, however, until the Canadian patent application is approved.

Another joining method — dip brazing—was discussed by William J Graves of Dalmo Victor Co. Dip brazing joins metallic parts by submerging them in a molten-flux bath whose temperature is below the melting point of the parts to be joined but above the melting point of the brazing or filler alloy. Unlike fusion welding, the parts themselves are not melted, so the problems of warpage and shrinkage, encountered particularly in thin sections, are practically eliminated by this relatively new process.

Therefore, it had obvious advantages in helping to hold close inside tolerances on the broadband waveguide systems manufactured by Dalmo Victor. Thus far, two parent magnesium alloys have been successfully brazed, M1A and Z31B. Most satisfactory filler has been AX 125 with Dow brazing flux #452.

New Metering System

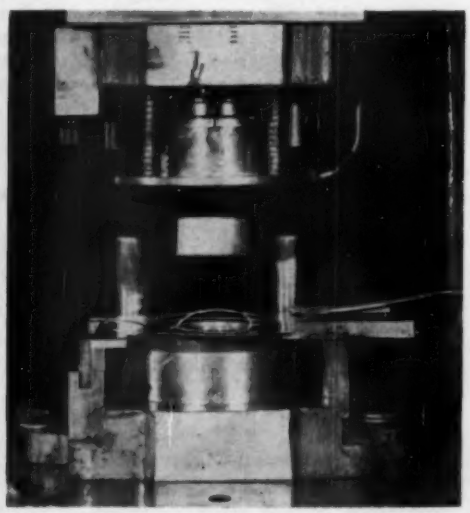
F C Bennett, in another paper, described a new metering system developed by The Dow Chemical Co for supplying molten magnesium to cold-chamber die casting machines. The process is claimed to be "simple in principle, flexible in operation, continuous, safe, easy to run, and produces good castings." In production tests, it has equalled the output rates achieved by hot-chamber machines, and at the same time, it has avoided some of the limitations inherent in the hot-chamber process.

Other papers presented at the convention covered new developments in no-draft pressings (*AM*—Oct 21 '57, p 137), extrusions, precision castings, chemical milling, cored passages in magnesium castings, structural design, and the possible applications of magnesium in future aircraft and missile structures.

The magnesium business, according to those present, is off somewhat from earlier hopes, but considering the fact that a large portion of magnesium applications are military, the industry has not suffered as much as might be expected from the recent, widely publicized aircraft industry cutbacks.

Civilian applications are increasing, and it is gaining wider acceptance, not only for its lightness, but also for its lower fabrication costs.

Kaiser Deep Draws Seamless Aluminum Cans



New drawing technique at Kaiser Aluminum & Chemical Corp, Oakland, Calif, which will be licensed out to can manufacturers, turns out a seamless aluminum can body and bottom in one piece in one operation, producing can bodies to a depth three times their diameter in a single stroke, with walls as thin as 0.005 in. Can sizes and shapes can be widely varied on the same equipment, requiring only 15 minutes for die changeover. Press (left) forms can bodies by drawing disks of aluminum sheet through cupping, ironing and bottoming dies automatically in a single punch stroke. Disks are fed into press, which can be operated simultaneously from both ends, from above. Photo at right shows completed can body (in this case a fairly shallow one) being ejected from a "one-time" shallow draw and trim die mounted in a single-action vertical press that blanks, forms, flanges, sizes and trims the body in one stroke. Die is said to be only one that can do all this at once.

Gisholt Unveils "Factrol" Tape Controls

CHICAGO—"Factrol," a considerably improved version of a magnetic tape control system for automatic operation of turret lathes announced several years ago, was described here at the 13th Annual National Conference on Industrial Hydraulics on October 17 and 18 by Gisholt development engineer Leonard Hesse.

The new version of this control system is the result of several years of Gisholt research and development, undertaken to develop machine tools that operate from information stored on re-usable magnetic tape.

Further Research Under Way

Now undergoing further development tests, a prototype automatic turret lathe equipped with "Factrol" magnetic tape control has already shown worthwhile results in terms of trouble-free operation, ease of programming, and savings in floor-to-floor time on short-run jobs. Commercial versions of this lathe will not be ready for some time, according to Mr Hesse, who predicted the lathe is perhaps two or more years away from the market.

Two-Unit System

The Factrol system consists of two relatively compact units—a playback control mounted on the machine, and a desk-type portable recorder that can be set up in any convenient location in the shop or in an engineering office any distance away from the machine.

Stroboscopic Viewer

An important feature of the playback unit is a stroboscopic viewer that allows the operator to read the longitudinal or cross position of each slide or carriage on the machine to within 0.001 in., and to estimate its position within a few ten-thousandths of an inch. Adjustment of these positions can be made with compensating knobs on the setup panel, which has features that make the system extremely flexible.

Because the Factrol system is purely an analog one, the parameters controlling its various functions may be changed from the setup panel, within certain limits. This allows modification of the information recorded on the tape within the built-in limits, whenever necessary, without removing the magnetic tape from the machine.

Tool changes can also be quickly accomplished, because exact setting is not necessary. Cutting tools can be inserted close to the correct position, then brought into the exact required position by a compensating adjustment.

Seven-Track Tape

Magnetic tape used in the Factrol system may contain as many as seven tracks of information, depending upon the complexity of required tool movements. One track controls the auxiliary functions (spindle speed, indexing and other step functions). The other tracks control the motions of slides and carriages for threading, reaming, and straight or contour turning and boring. Movement is actuated by hydraulic cylinders that are controlled by servo-valves, which are electrically connected to the control panel on the machine.

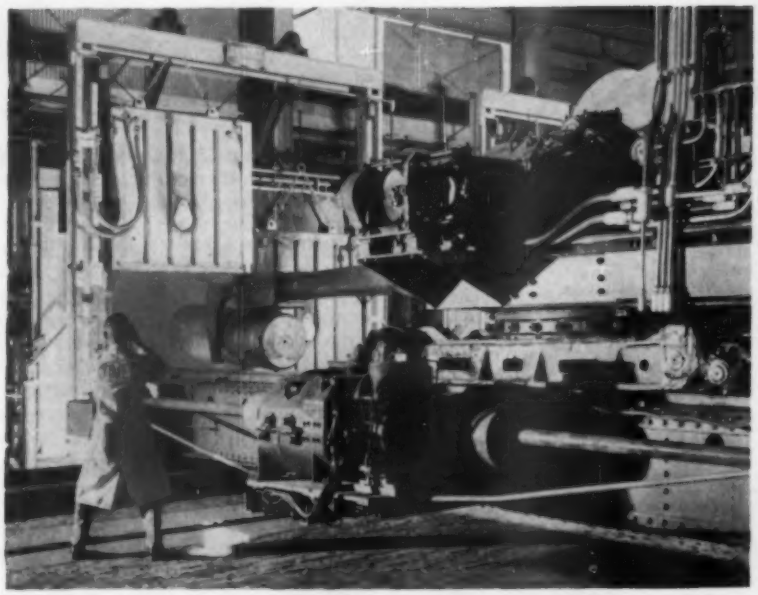
Open-Loop Circuitry Described

Another Conference paper, presented by Norbert J Nitka of OilGear Co, described use of electro-hydraulic pump strokers for versatile open-loop hydraulic circuitry in control of machine tools and other production equipment. Such systems are easily modified by simple changes in the electrical circuitry, rather than by costly changes in mechanical and hydraulic elements.

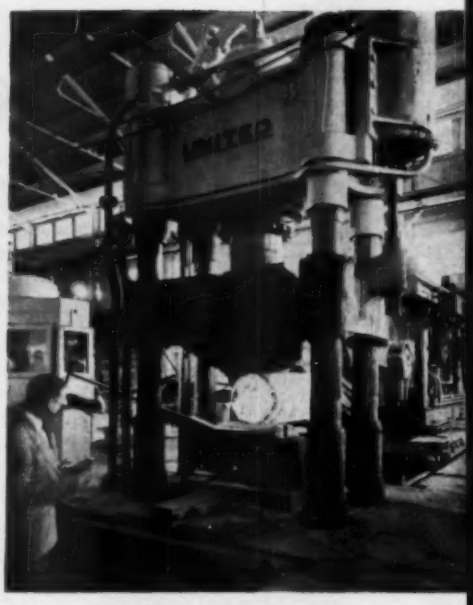
Attendance at the two-day conference, which was held at the Illinois Institute of Technology in cooperation with several technical societies, totalled 813, just about the same as that for last year, according to Conference officials.

Five-Day Machine Tool Exhibit for Philly Area

Said to be the first of its kind in the Philadelphia area, Delaware Valley Machinery Inc's five-day operating exhibit, "Modern Machine Tools in Action," drew several hundred metalworking executives and operating men to the company's new showrooms in Willow Grove, Pa, October 8-12. Machine tools from more than a dozen manufacturers were demonstrated under power, including those of LeBlond, Fosdick, Mattison, Famco, Minster, Barnes Drill, Johannson, Kempsmith, Linley Brothers, Lucas of Cleveland, Peerless, Rockford Machine Tool, Sellers and Hammond Machinery Builders. In all 34 machines were demonstrated



Heating of double-vacuum melted 26-in. ingot . . .
which has been fully machined to remove surface impurities, is done in a box furnace with temperatures held uniform throughout to within less than ±10 F. Uniformity of heat is checked by optical pyrometer tests



Forging hammer . . .
reduces ingot to a 16-in. square. In later heats, billet may be shaped to a 7- or 8-in. round. Two manipulators pass the billet between the dies

New Mill Strengthens Competitive

TORONTO, OHIO—Improved technology for fabrication of titanium-alloy products is expected to result from the advanced mill-processing techniques being worked out here by Titanium Metals Corp of America. This jointly owned subsidiary of the National Lead Co and Allegheny Ludlum Steel operates the world's first plant devoted exclusively to production of titanium-alloy sheet and billets.

Equipment in the Toronto plant has been developed specially for rolling and forging titanium—a metal which has a number of peculiarities. Its lightness and great strength recommended titanium for aircraft and missiles. Cutbacks in the military procurement programs now force, at least for some time, the development of commercial outlets.

Contracts Already Under Way

One contract under way is for the production of extrusion billets for seven miles of piping to be installed in a nickel-ore processing plant, where corrosive conditions are severe. Titanium is also being tried in pumps, heat exchangers, valves, pressure vessels, etc, used by chemical industries and oil refineries.

In applications such as these, and others to be uncovered by a product-development program now actively underway, metal price vs service life is the important matter. The composite mill-products price—based on sheet, strip, bar and billet has been cut 33% in the last three years and is now about $10.50 per lb.

Improved efficiency from the new machinery now being installed at Toronto is expected to make titanium more competitive.

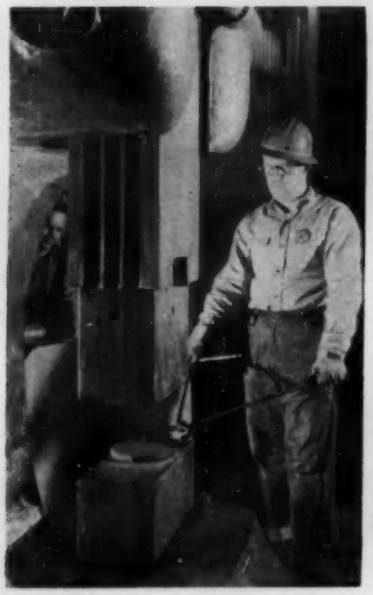
Close Controls Are Vital

Like stainless, the problems in rolling or forging titanium and its alloys, are resistance to plastic flow and close control of temperature and cleanliness—only more so. If not closely controlled, the result is unsalable scrap. Titanium cannot be worked at a desirable temperature. Therefore, the metal can only be processed at a lower temperature under very close control (plus or minus 10 F instead of plus or minus 25 to 30 F or even higher, as with stainless).

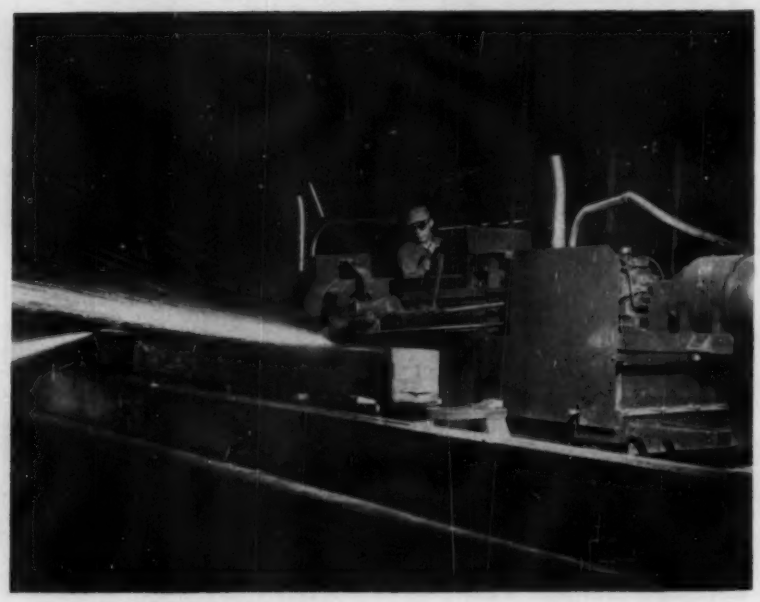
Electronic proportioning-type controls made by Leeds & Northrup are required. More reheats are necessary. And because titanium picks up gases from the atmosphere and water vapor, especially hydrogen that causes embrittlement, all furnaces must be of electric or radiant tube type under positive pressure and with oxidizing atmosphere. Even when a billet is to be ground to remove forging scale, it is necessary to preheat the billet, and it is likewise necessary to stress relieve the billet after grinding.

The forging line has now been installed and the sheet mill is now being made ready. Here, a seven-zone electric furnace will feed stock to two United mills, rebuilt to roll titanium. Furthermore, a Sendzimir mill is to be installed to cold roll titanium to close tolerances.

A feature of the sheet mill is a vacuum furnace for removal of hydrogen. This 30-ft-high installation will produce a vacuum close to that used in evacuating lamps.

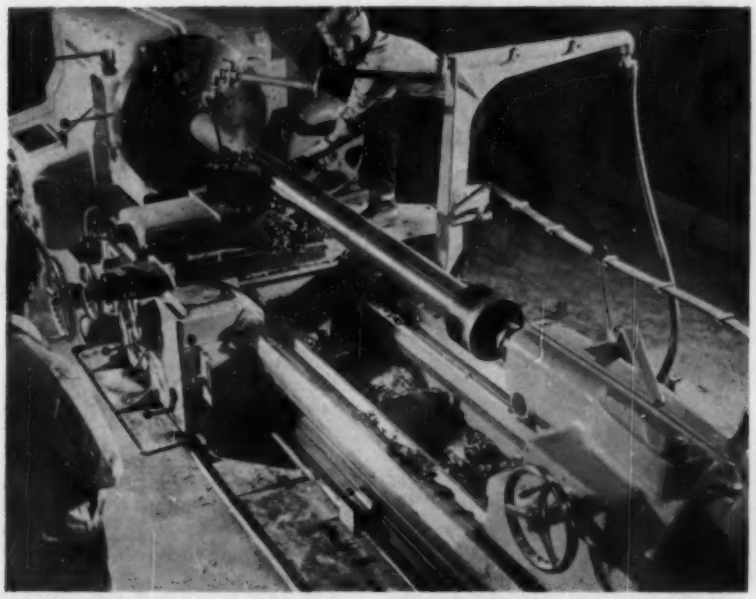


Test sections are cut . . .
from top and bottom of every heat and are upset on this 3000-lb forging hammer as a check on material uniformity



Scale and surface imperfections are removed . . .
from billets by these Midwest grinders, which are typical of steel mill equipment. Constant effort is made to avoid hammering scale into billets. Grinding dust is collected and removed from building

Position of Titanium



Close surface finish specifications are followed . . .
as seven new American Pacemaker lathes take off about ½ in. on a diameter of 7 in. forged rounds of aircraft-quality titanium alloy. Test pieces are cut from billets corresponding to top and bottom of ingot and forged to check forging quality and customer acceptability. All bars are supersonically tested 360°

Buhr Purchases Sidney Machine Tool

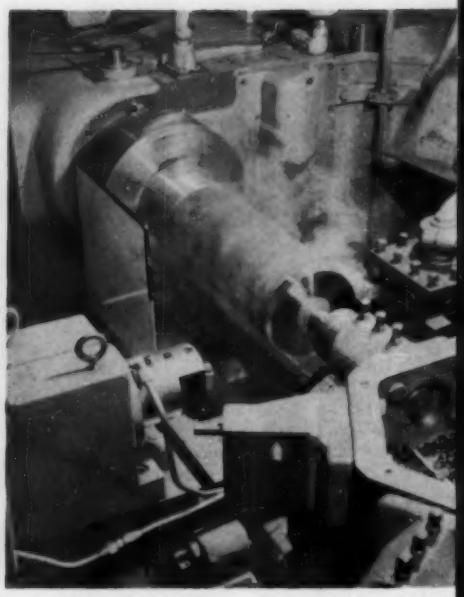
ANN ARBOR, MICH—Sidney Machine Tool Co, Sidney, Ohio, manufacturer of heavy-duty precision metalworking lathes, has been acquired by Buhr Machine Tool Co, Ann Arbor, Mich, and will be operated as a wholly owned subsidiary of Buhr, continuing to manufacture and market Sidney lathes and coil winders.

Joseph H Buhr, president of the parent company, will also become president of Sidney, and W R Gerchow will become executive vice president and general manager of Sidney. He holds a similar position with Buhr. Both men will continue to headquarter at Ann Arbor.

The 53-year-old Sidney Machine Tool Co began as a manufacturer of woodworking machinery in 1904, didn't enter the production of metalworking lathes until 1914. Since 1937, Sidney has been devoted almost exclusively to production of metalworking lathes—manufacturing a complete line of precision toolroom and engine lathes from 14 to 32 in., in models 16 and 32. The firm also makes the Sidney Fluid Tracer in the same range of models, in both conventional and universal types.

NEWS REPORT

Test cut of new ceramic toolbit . . .
in machinability test laboratory at Watertown Arsenal. Setup includes dynamometer mount for the tool and provides chart record of radial, tangential, and feed forces thoughout the test



Scale is skinned . . .
from 6150 test log with new ceramic toolbit before start of tool-life test. Speed here is 1500 sfpm

Ceramic Tool for Roughing Cuts?

WATERTOWN, MASS—A new ceramic tool material being tested at the Rodman Laboratory of Watertown Arsenal here shows signs of providing substantially improved tool life and of being more suitable for roughing cuts. In the first series of tests, the new tool removed an average of 3600 sq in. from test logs of 6150 steel, compared with an average of 500 sq in. for the previous tool from the same source.

The new ceramic tool was developed in the laboratories at Norton Co and is designated LA 687. Norton does not sell ceramic tools directly, but Vascoloy-Ramet is expected to announce the availability of the new ceramic this week.

The earliest tests of ceramics for metal cutting in the U S were made by Rodman Laboratory (*AM*—Feb 28 '55, p153) and the laboratory, now better equipped for machinability tests, has continued its study of ceramics and its search for better holders and geometry because of the possible need for tools made of noncritical materials in an emergency.

Tests are made on a J & L lathe fully equipped for machinability testing. The standard test devised for ceramic tips is made on 6150 steel (200 Bhn) at 1500 sfpm, 0.011 ipr feed, and 0.100 in. depth of cut.

Based on the discovery (at Ohio State) that tool life can be gaged by the increase in feed force, the test is run until there is a 25% increase in feed force. A calculation of the sq in. of metal removed (at the standard 0.100 in. depth of cut) serves to compare different tools and operating conditions.

Properties of the Tool

LA 687 is a hot-pressed aluminum oxide containing a minimum of additives to control structure. Grain size of the particles is considerably smaller than in previous Norton ceramics.

There does not appear to be any measurable difference in hardness, but a wear test originally devised for grinding wheels does show a difference. About 250 cc of sand is blasted against the ceramic at 25 psi. Wear on the present Norton ceramic in this test is about 0.003 in. On LA 687, it is 0.0005 in. This six-to-one difference in wear resistance is about the same as the average of life tests made at Watertown Arsenal (500 sq in. and 3600 sq in.) on the two tools.

At the Grinding Machine Div of Norton, the new toolbit is being used in hogging off spindles of 3450 steel. Regular cuts are 0.25 in. depth, with **0.011 ipr feed, at 1000 sfpm.**

Interrupted Cuts

As yet there has been little chance to test the ceramic on interrupted cuts, though it has been used to face gray iron castings containing drilled holes with success. Further tests will be made both on interrupted cuts and with milling cutters tipped with the new ceramic.

All of these tests were made with 5° negative rake angles and a 45° negative land on the tip. The new ceramic has also been used to turn large chilled iron rolls. The lowest speed on the lathe gave 45 sfpm and at this speed carbide tools broke. The rolls were turned with ceramic tools at speeds from 66 to 170 sfpm, 0.090 in. depth of cut, and 0.008 ipr feed.

The new ceramic is the survivor from a series of about 60 compositions developed at Norton, of which 19 of the most promising have been tested at Watertown Arsenal.

Arvid O Lundell, president of Colonial Broach & Machine Co, has been appointed adviser to the director of the Metalworking Equipment Division of the Business and Defense Services Administration, Washington

Chester S Johns, formerly associated with the Cross Co, has joined Buhr Machine Tool Co as sales manager.

Lowell Jensen has been appointed works manager of Famco Machine Co

NAMES IN THE NEWS...

Frank W Jenks, associated with International Harvester Co since 1914, has succeeded **Peter V Moulder** as president of the organization.

Stanley S Davies, general manager of Royer Foundry & Machine Co, Kingston, Penna, has been elected to succeed his father, the late **Stanley B Davies,** as president of the firm.

Philip A Rudge has been promoted from assistant manager to manager of the Windsor Engine Plant of General Motors of Canada, Ltd. He takes over the post of **D K MacDonald** who has retired.

William Staecker, chief engineer of E W Bliss Co's Canton Division, has joined the general office staff as assistant manager of engineering for the company's Press Division. **Alfred Drain,** project engineer, replaces Mr Staecker.

John M Fox, manager of Black & Decker Manufacturing Co's Towson, Md, plant, has been named Hampstead (Md) plant manager succeeding **Karl B Salanda,** appointed director of industrial and plant engineering. **William B Ford Jr** has rejoined B&D as manager at Towson.

P H Richey, executive vice president of Wagner Brothers Inc, Detroit, has been named president of the company's newly acquired subsidiary, Automatic Molding Machine Co of Los Angeles. Additional officers are **F M Mansfield,** vice president, sales; **Bruno Leonelli,** vice president; and **Irvin Tochner,** vice president, operations.

Elbert G Bellows has been elected a vice president of W L Maxson Corp, New York; he moves up from the post of assistant vice president of the Contracts Division. **William P McNally** has been appointed sales manager.

Tjark F Riddle has moved up from assistant manager to manager of the Kansas City assembly plant of the Ford Division of Ford Motor Co.

A S Chivers, general manager of Barry Controls' Western Division plant at Burbank, Calif, has been appointed vice president of the division.

James Armour has been promoted to sales manager of the Cutting Tool Division of Brubaker Tool Corp, Millersburg, Penna. His former post as assistant sales manager is being taken over by **Mark E Cooper.**

P F Bauer, general manager of Allis-Chalmers' Industrial Equipment Division, has been named managing director of A-C International, new major operating division. **Paul Dietz** and **Floyd J Mischke** have been named associate directors of sales. New division will handle all manufacturing, engineering, and sales operations and activities outside of the US and Canada.

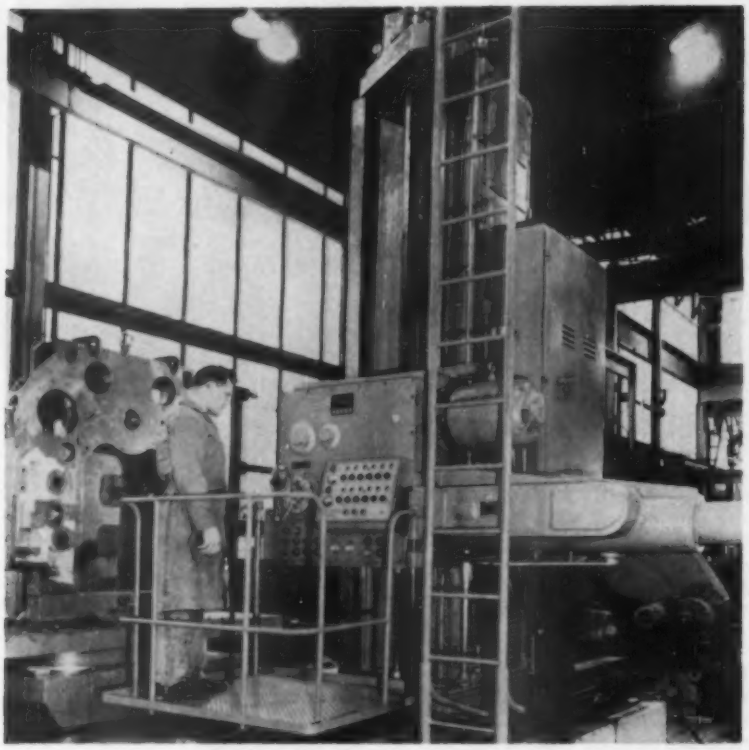
Matthew J Betley has been named president of Titeflex, Inc, Springfield, Mass. He was formerly vice president and general manager of Aeroquip Corp, Jackson, Mich.

Obituaries

Clayton R Burt, 82, former president of Niles-Bement-Pond Co, now known as Pratt & Whitney Co, died Oct 21. Mr Burt, who retired in 1950, was also former president of Potter & Johnston Co, formerly a Niles and now a P&W subsidiary. He joined Niles in 1924 as general manager, became president in 1930, and board chairman in 1943. He was president of the National Machine Tool Builders Association in 1936-37. During his long industrial career Mr Burt was associated with Brown & Sharpe Manufacturing Co, Providence, RI; Barber-Colman Co, Rockford, Ill; Russell Motor Car Co, Toronto; New Process Gear Co, Syracuse, NY; and the Austin Machinery Co, Toledo, Ohio.

Dr Paul Dyer Merica, 68, prominent metallurgist and former president of International Nickel Co of Canada, Ltd, and of International Nickel Co, Inc, U S subsidiary, died Oct 20.

Lloyd W Swanson, assistant sales manager of Rockford Machine Tool Co, died Oct. 7.



Punched Tape, Dial, and Manual Control Combined in Single System

This floor-type horizontal boring, drilling, and milling machine is fitted with the new Kaukauna Automatic system of machine control. The system is designed to operate standard machine tools through manual control, through dial control of discrete digital dimension information, or through an 8-channel binary code punched tape.

A selector switch in the control panel permits switching to the different control methods.

Programming for any job calling for precise location of a dozen or so holes can be completed in less than 30 minutes. This is from blueprint to finished tape—ready for insertion in the machine. The design engineer preparing the blueprint must dimension the hole locations according to X-Y coordinates, not polar.

Machines equipped with these controls can eliminate expensive layout operations, jigs, and fixtures for many small-lot precision operations in typical jobbing shops working with medium to relatively large workpieces.

Manual Control

Three manually operated pushbuttons control spindle operation. Two buttons are provided for rapid traverse and positioning of headstock on the column. Each button is a dual-position button. Depressing button fully puts machine in rapid traverse at 100 ipm; depressing button halfway provides inching travel at 4 ipm. Machine can be positioned to 0.001 in.

Digital Dial Control

The digital turrets and measuring system are engaged by throwing switch to "dial." Reading dimensional data directly from the part print, operator dials the head and column dimensions on the digital turrets provided on the panel. Depressing the read-in button transfers the dialed dimensions to the visual light numbers for checking. This operation also sets up the electronic circuits required. Depressing the automatic traverse button positions the machine to dimension called for; machine takes shortest path to selected position. As machine comes into position, two electronic verniers indicate to 0.0001 in. the accuracy of positioning. Operator then starts the machining operation. While machining at this location, the operator preselects the next dimensions. The measuring system must be zeroed for the first workpiece.

Binary Code Tape Control

Tape is prepared on a standard commercially available tape producing typewriter. After the tape is loaded and the tape reader panel has been put into operation, the operator depresses the read-in button to deliver the first block of tape information to the machine. As it comes into position, the electronic verniers, graduated to 0.0001 in., show machine error. During the machining operation the operator feeds the next block of information to the machine. As soon as spindle is withdrawn the operator presses the automatic traverse button and the machine will locate itself at next desired position.

Measuring System

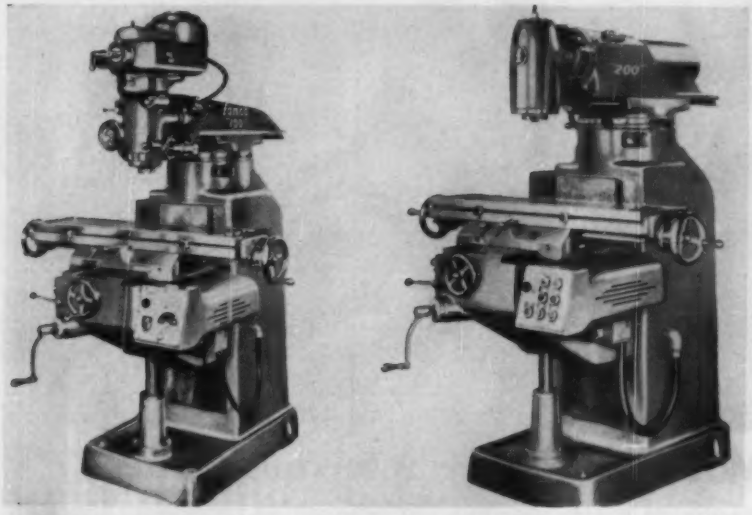
The automatic measuring system had to measure accurately to 0.001 in. and have unlimited measuring control for the full travels of the horizontal boring machine. It also had to be divorced from machine accuracy to eliminate errors due to machine wear or drive wear.

An electronic scale, commercially known as Inductosyn, was selected. This electronic glass scale is made up of 10-in. sections with an air gap between each section. This minimizes temperature effects on the accuracy of the system. The electronic slider measuring the current in the glass scale operates through an air gap.

Present machines (two for Miehle-Goss-Dexter, Inc; one for General Electric) all use the same type of digital control system. This is made by Farrand Controls, Inc, New York, NY and costs $32,000 to $35,000 or more depending upon complexity.

Giddings & Lewis Machine Tool Co, Kaukauna Machine & Foundry Div, Kaukauna, Wis

MATERIALS AND PARTS



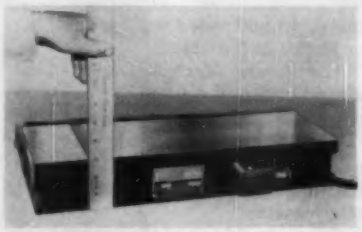
Famco Introduces 1- and 2-hp Vertical Milling Machines

The Famco 100 1-hp vertical mill (left) is primarily a toolroom mill and it has a speed range of 120 to 4300 rpm or an optional range of 75 to 2800 rpm. Speed changes can be made while spindle is running. Power feed to the quill provides three feed rates—0.0015, 0.003 and 0.006 ipr. Located above the spindle nose is a micrometer depth gage stop graduated in thousandths. An overload release clutch is designed to slip at the stop setting or at excessive drill-point pressure. Spindle has a No. 30 National Std taper and drawbar.

The Famco 200 2-hp mill (right) is built for heavy production work. The motor rotor, located at rear of ram for balance, mounts directly on the first change gear shaft, thus eliminating all unnecessary power transmission links. Twelve spindle speeds are provided in a range of 80 to 2100 rpm. A pushbutton control station is remotely located from the button control cabinet and positioned for maximum operating convenience.

Both machines feature extra-heavy knee, saddle and table construction. The 15-in.-dia overarm turret permits accurate positioning of spindle head over a large work area. Anti-backlash adjustments on both table and saddle leadscrew nuts assure accurate feeding. Table-saddle ways, saddle-knee ways and all leadscrews can be lubricated with one shot. Hand-scraped tapered gibs maintain the accuracy of machine and workpiece. An opening between the knee and column face allows chips to pass through rather than build up against column.

Famco Machine Co, Kenosha, Wis



Magnetic Chuck Provides Maximum Height Under Grinding Wheel

Model CL electromagnetic chuck stands only 2⅞ in. high and is available in seven sizes, 5 x 10, 6 x 12, 6 x 18, 8 x 18, 8 x 24, 10 x 15 and 10 x 16 in. It features all-steel welded construction and a fine pole laminated top which offers a uniform holding power, right out to the edges of the face plate. Unit plugs into ac line, is moisture and shock-proof, and is furnished complete with rectifier and built-in switch.

Hanchett Magna-Lock Corp, 456 Maple St, Big Rapids, Mich

including...

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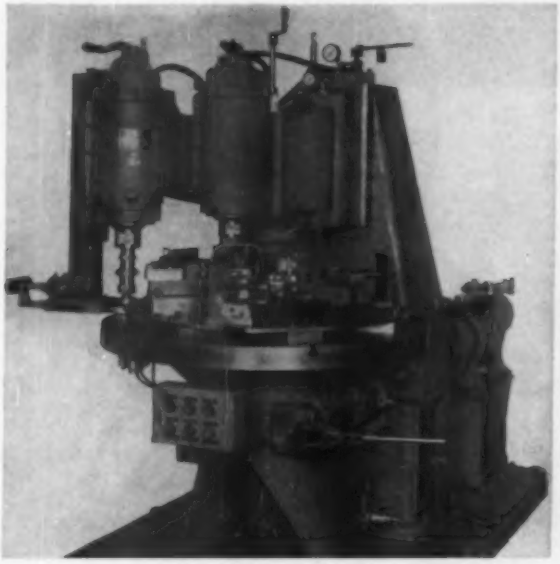
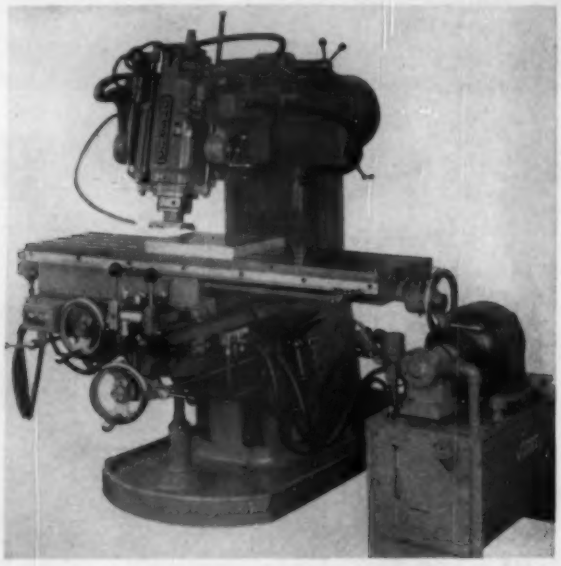




High-Speed Milling Machines Work Nonferrous Metals

This new line of milling machines is designed for aluminum, magnesium, brass and related nonferrous metal milling. Designated Mach-Mils, the machines are built as two basic types —those with rotary feed tables, represented here (left) by the Model DA-50AE vertical contour and face milling machine; and those with rectangular tables and planer-type or standard milling machine table feeds, represented here (right) by the Model A-245 universal fluid-feed machine.

Basic design of the rotary table Mach-Mils comprises a rotating table that holds the fixture and work and feeds the work to the cutter, and a milling head mounted on a pivoted overarm for movement in an arc from roughly table center to table edge. The table setup consists of a templet and the workpiece. Milling head assembly carries the cutter and the templet follower. On the dual-head model illustrated, both milling heads are vertically adjustable in a 9-in. range, with max distance of 13 in. from cutter to table. Table feed is from 1.7 to 3.5 rpm and table dia is 40 in. An allowable overhang of 5 in. increases the table working diameter to 50 in. This machine is supplied standard with two-speed 7½/3¾-hp, 3600/1800-rpm motors. As on all the rotary table models, a cam control permits changing the rotary table feed rate during the feed cycle of table.

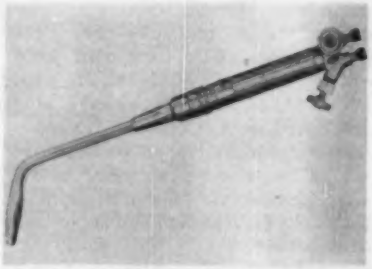
The rectangular table Mach-Mils combine high-speed milling heads with fast mechanical or hydraulic power feeds to give high-speed production on a wide variety of nonferrous parts. The machine illustrated is a knee-type unit providing milling speeds up to six times as fast as standard machines of this type. All table feeds are hydraulically powered. Table measures 14 x 56 in. and has a longitudinal travel of 28 in. with speeds from 0 to 150 ipm; transverse travel of 14 in. with speeds from 0 to 150 ipm; and a vertical travel of 10 in. with speeds from 0 to 50 ipm. The universal head tilts 30° in either direction in both the longitudinal and transverse plane. In-and-out movement of ram or throat is 9 in. max.

The entire Mach-Mil line is designed to produce work to tolerances of ±0.0005 in. or better. Because of the high rotational speeds of the milling head spindles, surface finish usually measures just a few micro-inches.

Other machines of the rotary table feed type include the Model AA-50AE single-head vertical face milling machine, A-50AE vertical contour mill, A-28 dual-table contour mill, and the A-18 contour mill (a smaller version of the A-28). The other rectangular table machines include the Model A-242S Tri-Way mill for milling 1, 2 or 3 sides of a part at one time, the A-242A Duplex mill with two opposed milling heads, and the standard A-245, which is similar to the A-245 described earlier except that the standard model does not have the universal head.

The machines are built for continuous, automatic feeds throughout the milling cycle. Special machines are available with indexed rotary or planer-type feeds for such operations in sequence as milling, boring and drilling. Catalog 1162 available.

Onsrud Machine Works, Inc, 7780 N Lehigh Ave, Niles, Ill



Linde Welding Blowpipe Offers Widest Work Range

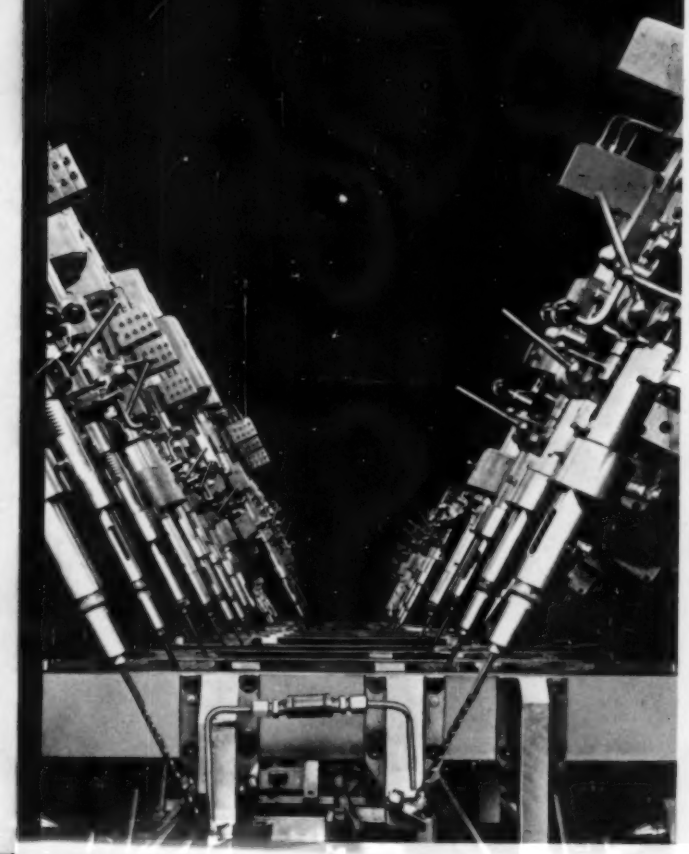
Oxweld W-47 blowpipe, a new medium-pressure welding blowpipe capable of welding any metal thickness from 28 gage to 3 in. and handling heating jobs requiring total gas flows up to 1500 cfh, is available with a complete selection of welding and heating heads, extensions, and accessories. The standard oxygen or acetylene flow (2 to 300 cfh) can be boosted to 1500 by addition of fuel gas heating heads. A convenient cutting attachment equips the blowpipe for flame-cutting on metal up to 8 in. thick.

Linde Co, Div of Union Carbide Corp, 30 E 42 St, New York 17, NY

carbide TOOL NEWS

These suggestions are condensed from Issue #3 of Wesson's publication, "PRODUCTION LINE".

how to cut unnecessary down-time



You can't eliminate *all* machine down-time. Machines do need maintenance and the best of tools can't stay sharp forever.

BUT—

You can eliminate most UNNECESSARY down-time—and it is the unpredictable and unintentional down-time that usually costs the most.

Three main causes of avoidable down-time are: Tool failures, too rapid tool wear, and excessive set-up time.

To minimize these causes we suggest the following as being well worth remembering in selecting, testing, applying, specifying and procuring tools:

For any given job, there is always ONE SPECIFIC carbide grade that is BEST.

Tool Failure

Except for the occasional accident due to hard spots, excess material, momentary power failure, etc., tool failures can be avoided by good tool practices.

The so-called "equivalent" or comparison charts for carbides are deceiving. Time and again, one carbide will stand up on a job while "equivalent" grades break down rapidly. Increase in life of 3 to 1 and 6 to 1 and even more are not un-

(Continued on next page)

WESSON Throw-away Tooling Combines Operations

With **WESSON** "throw-away" tooling, you can cut the number of separate operations on a part by combining several in a single tool assembly. The reasons:

1. Sharpening of complex tools is eliminated
2. Tool-change time is cut way down
3. Ingenious tool designs let you use throw-away inserts in more places
4. Wessonmetal carbides give long life between "tool changes".

FIG. 1

FIG. 1—An example of how separate operations are eliminated by combining tools. This cutter does the lion's share of the work in producing brake-drums for a prominent 1958 car. The twenty tools include six single point brazed tools with screw adjustment, and 15 throw-away insert types. They rough bore the entire drum, chamfer it, plunge cut a face on the OD and a cooling groove between ID and OD.

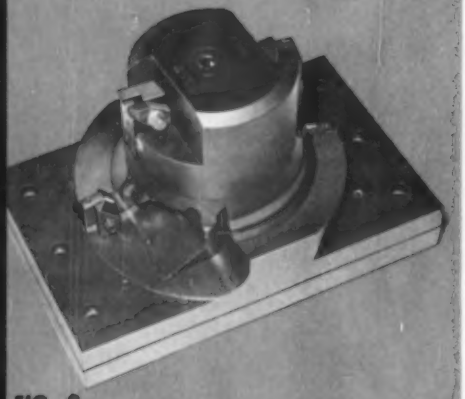


FIG. 2

FIG. 2—Just four identical throw-away tips, ½ inch square, plus one diamond shaped throw-away tip in this tool do all these things on large special pipe couplings: (1) taper bore; (2) relieve; (3) face the end; (4) chamfer the ID; (5) chamfer the OD. Combining these in a single tool has tripled productivity.

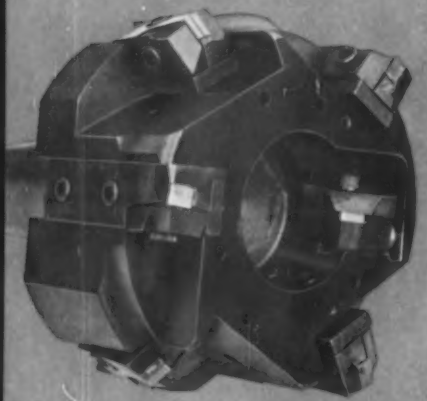


FIG. 3

FIG. 3—Inside a well-known automatic transmission, there is a band-retainer housing with an internal hub. To bore the housing, turn the OD of the internal hub, chamfer the part and counterbore the hub, only one operation is needed. Only one tool is used—a WESSON Multicut boring head. The turning and chamfering tools for the internal hub are micro-adjustable. The entire design is made possible by throw-aways.

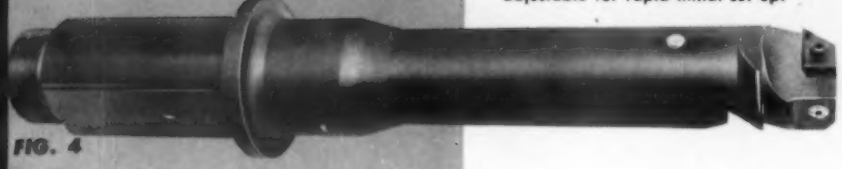


FIG. 4

FIG. 4—There are two opposed triangular Wessonmetal throw-away tips on this tracer-controlled Multicut boring bar. They profile bore the entire complex ID of a turbine part. One tip cuts going in. The other cuts coming out. Both are micro-adjustable for rapid initial set up.

TOOL NEWS carbide

PRODUCTION LINE #3

If you would like a copy of this publication, just jot down your name and title on your company letterhead and mail it to: Editor, PRODUCTION LINE, at the address below.

tools Wesson carbide Wessonmetal

WESSON COMPANY DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.
IN CANADA:
WESSON CUTTING TOOLS, LTD.
93 JUDGE ROAD, TORONTO 18, ONTARIO

How to cut unnecessary downtime

(Continued from previous page)

usual. The decrease in down-time for tool changes is in proportion of course.

Tool Life

The same factors hold true for tool wear. Time and again tests show even so-called equivalent grades varying as much as 2: and 3:1 and up, in pieces per grind—without any variation in feeds, speeds, depth of cut, etc.

Obviously on-the-job tests are an important factor in specifying the *best* carbide grade for the job.

Set-up Time

When tooling up, it pays to consider what type of tool will give you minimum set-up time when changing tools. Frequently **WESSON** throw-away tooling will cut down-time enormously. When tool change is necessary you release the insert with a twist of a hex wrench. Index the insert to a new cutting edge. Clamp it with another twist of the wrist. You're ready to go—with the least possible machine time lost.

How to do it

To cut unnecessary down-time, what is needed is a plant-wide cost reduction program that seeks to cut down-time through improved tooling practices.

You can simplify and speed such a program in your plant. Wesson's unique in-plant-engineering service has never yet failed to produce major cost reductions. The same service is available without cost to you on a plant-wide program basis.

Litho in U.S.A.

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FOR YOUR INFORMATION

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To get the ones you need just list number of each booklet described on this and the following pages. When you have filled out card, simply detach and mail. We'll do the rest. Postage is prepaid.

MACHINES AND ATTACHMENTS

1 MACHINE TOOLS—*Jones & Lamson Machine Co, Springfield, Vt.* 21-page general catalog 57 contains illustrated information on line of products including turret lathes, Fay automatic lathes, precision boring machines. Hydraulic tracing attachments, numerically controlled positioning tables covered.

2 CYLINDRICAL GRINDING MACHINES—*Landis Tool Co, Waynesboro, Penna.* 16-page catalog D-57 pictures and describes features of 14-in. and 18-in. swing units designed to carry work up to 6500 lb; supplied in center lengths from 48 to 168 in.

3 MACHINE TOOL CONTROLS—*True-Trace Sales Corp, 9350 E Rush St, El Monte 36, Calif.* 24-page bulletin illustrates and describes continuous and intermittent positioning systems, hydraulic tracers, numerical controls and programming consoles. Data provided on accessory units such as hydraulic cylinders, power units, hydraulic milling spindles, coolers and mounting brackets.

4 PRECISION SURFACE GRINDERS—*Abrasive Machine Tool Co, Dexter Rd, East Providence, RI.* Illustrated 6-page brochure gives detailed information on features, capacities, weights, and specifications of new Hydrabrasive No. 824, 1218, and 1224.

5 VERTICAL MILLING MACHINE—*Famco Machine Co, 3100 Sheridan Rd, Kenosha, Wis.* 12-page catalog pictures and describes 1 and 2-hp vertical mills. Cost-cutting production features discussed.

6 NON-FERROUS MILLING MACHINES—*Onsrud Machine Works, Inc, 7720 N Lehigh Ave, Niles 31, Ill.* 24-page catalog 1162 illustrates and describes new series called "Mach-Mils." Includes data on machine specifications, work capacities, hyper-speed cutting heads and high feeds.

7 AUTOMATIC STAMPING PRESSES—*Brandes Press Co, 6408 Euclid Ave, Cleveland 3, Ohio.* 14-page illustrated brochure contains descriptions and specifications of 15 to 4000-ton capacity units, inverted type. Large double-crank presses for king size dies also covered.

8 OPEN DIE ROD HEADERS—*Waterbury Farrel Foundry & Machine Co, Cold Heading Equipment Div, Waterbury, Conn.* 8-page illustrated circular 866-A-3 describes line. Covers production features, operation, blank handling, punches and dies, heading units and drives, specifications.

TOOLS AND ACCESSORIES

9 COMBINATION HARDNESS TESTERS—*Torsion Balance Co, Clifton, NJ.* 4-page bulletin presents illustrated description of the four Kentrall units; each makes both regular and superficial Rockwell tests. Range of standard and accessory equipment covered.

10 DIES AND DIE FINISHING EQUIPMENT—*Firth Sterling, Inc, 3113 Forbes St, Pittsburgh 30, Penna.* 12-page illustrated catalog FDM-57 covers line of Firthaloy dies and machinery and Diecarb perforators. Specifications and price lists.

11 DUAL OUTPUT LUBRICATOR—*Bijur Lubricating Corp, 151 W Passaic St, Rochelle Park, NJ.* 2-page illustrated technical reference, TR-57B, describes operation and applications of Type AP-Lubricator for machinery where various bearings require different lubrication cycles.

12 AUTOMATIC PINCH JAW CHUCKS—*Cushman Chuck Co, Hartford 2, Conn.* 4-page illustrated bulletin describes features of new line designed to overcome tooling problems encountered when machining parts of large diameter and small cross section, or pieces unable to be held in standard workholding devices.

13 STANDARD FLEXIBLE SHAFTS—*B W Elliott Manufacturing Co, 350 State St, Binghamton, NY.* 12-page bul-

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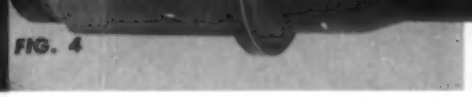

FIG. 4

a plant-wide program basis.

Litho in U.S.A.

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letin 250 contains detailed descriptions of units in seven sizes ranging from ¼ through 1¼-in. dia, in two types (bronze or ball bearing) and in four standard lengths each. Charts given operational data.

14 HOLE TOOLS—*Robert H Clark Co, 9350 Santa Monica Blvd, Beverly Hills, Calif.* Illustrated catalog gives data on tools using M-3 HSS for making holes in stainless and alloy steels on a production basis. Describes heavy-duty hole-mill, combination adjustable spot-facer and counterbore, 3-blade hole maker.

15 HEAVY-DUTY ELECTRIC DRILLS —*Thor Power Tool Co, Prudential Plaza, Chicago 1, Ill.* 4-page brochure JE-2263 describes new EN series of ⅜, ½, ⅝ and 1-in. reversible portable units. Specifications included for EL and EJ electric drill series, screwdriver-nutsetters, and impact wrenches.

HEAT-TREATING AND WELDING

16 WELDING DATA BOOK—*Eutectic Welding Alloys Corp, Technical Information Service, Flushing 58, NY.* 180-page 1958 edition of pocket-size book contains data on simplified welding procedures for every base metal; covers 120 welding rods, electrodes, and welding compounds.

17 INDUCTION HEATER—*Allis-Chalmers Manufacturing Co, Milwaukee 1, Wis.* 4-page bulletin 12B8513 describes features of high-frequency motor-generator equipment for lowcost brazing, annealing, deep hardening, forging, and melting. Covers 960, 3000, and 10,000-c units available in sizes from 30 to 1250 kw.

18 STEAM - ATMOSPHERE HEAT TREATING—*Leeds & Northrup Co, 4934 Stenton Ave, Philadelphia 44, Penna.* 21-page catalog TD2-620(1) describes effect on high-speed tool steel, cast iron, powdered iron, structural steel, brasses and bronzes, aluminum, beryllium copper, and molded rubber. Advantages discussed; furnace and control equipment described and illustrated.

PLANT SERVICE EQUIPMENT

19 CHEMICAL PROCESSING COMPOUNDS—*Turco Products, Inc, 6135 S Central Ave, Los Angeles 1, Calif.* 16-page illustrated manual discusses 57 metalworking processes including cleaning, phosphating, conversion coating, protective coating, rust removal and prevention, descaling, electroplating.

20 DUST AND MIST COLLECTORS—*Hammond Machinery Builders, Inc, 1618 Douglas Ave, Kalamazoo, Mich.* 12-page catalog 815 contains illustrated description of DusKolector and MistKolector units for use with dirt and mist producing machines. Includes specifications and accessories.

21 SPECIAL BLAST CLEANING MACHINES—*Wheelabrator Corp, 1140 S Byrkit, Mishawaka, Ind.* 24-page brochure 105-D illustrates and describes how airless blast cleaning, air blast cleaning, and wet blast cleaning have been employed in specific applications.

PARTS AND MATERIALS

22 DOUBLE - REDUCTION SPEED REDUCERS—*Cone-Drive Gears, Division of Michigan Tool Co, 7171 E Mc-Nichols Rd, Detroit 12, Mich.* 20-page catalog CD-230 covers 164 standard styles and sizes in ratios from 75:1 to 4900:1 available in worm over, worm under, or gear shaft vertical models; output torque ratings range up to 618,000 in.-lb.

23 ELECTRIC BRAKES AND CLUTCHES—*Warner Electric Brake & Clutch Co, Beloit, Wis.* 8-page illustrated catalog digest WEB 6292 contains data on brakes, clutches, and controls for miniature mechanisms or high-torque machine drives.

24 PRECISION INSTRUMENT BALL BEARINGS—*New Departure Division, General Motors Corp, Bristol, Conn.* 36-page illustrated catalog contains detailed information on full range of bearings of instrument classification. Charts and tabular data provide specific engineering information; bearing lubrication discussed; instrument bearing equivalents listed.

25 ALL-TEFLON SEALED HYDRAULIC CYLINDER—*Flick-Reedy Corp, Miller Fluid Power Division, 8040 N Hawthorne Ave, Melrose Park, Ill.* 8-page illustrated booklet outlines advantages such as freedom from many fluid and temperature limitations. Features described include new tubing end seal called Shef (for its resistance to shear, heat, extrusion, fluid) that replaces synthetic rubber O rings.

26 STAINLESS STEELS—*Sharon Steel Corp, Sharon, Penna.* 32-page illustrated catalog includes description, chemical composition, strength factors, physical properties, typical applications for a broad range of types, including the 200, 300, and 400 series.

27 "MICRO-VELVET" BALLS—*Hoover Ball & Bearing Co, Ann Arbor, Mich.* 8-page bulletin 101 contains specifications, application and design data for balls of chrome steel, stainless, brass, bronze, and monel in various grades and in sizes from 1/16 to 4½ in. in dia.

28 MAGNESIUM AND ALUMINUM ALLOYS—*Wellman Bronze & Aluminum Co, 18400 Shaker Blvd, Cleveland 20, Ohio.* 20-page catalog 57 lists physical properties and conforming specifications. Listings include alloys for sand castings, permanent mold, and rare earth alloys.

29 GEARED FLEXIBLE COUPLINGS —*Link-Belt Co, Prudential Plaza, Chicago 1, Ill.* 12-page illustrated booklet 2775 details application and selection data for couplings with max bores ranging up to 7 in. and ratings from 2½ to 572 hp per 100 rpm.

30 MINIATURE PRECISION BALL BEARINGS — *Miniature Precision Bearings, Inc, Precision Park, Keene, NH.* 24-page illustrated 1957 catalog outlines types and functions of standard radial bearings ranging in size from 1/10 to ⅜ in. OD. Includes bore dimension charts, load ratings, limiting speeds, mounting procedure, shaft and housing fits, torque conversion charts.

31 "TITANIUM PRODUCTION AND USE"—*Republic Steel Corp, 2100 E 45th St, Cleveland 27, Ohio.* ADV-903 is first of a new series of booklets on titanium. Explains and illustrates production and processing at Republic, gives detailed description of the metal's mechanical properties and typical uses.

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ALEMITE OIL-MIST AUTOMATIC LUBRICATION

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Alemite Oil-Mist *atomizes* oil into tiny, airborne particles that are distributed to bearings through tubing. It bathes all bearings with a cool film of clean oil . . . maintains uniform oil film regardless of variations in loads, temperature and speed. Simple, continuous, fully automatic. Eliminates the waste and uncertainties of the "human element" in lubrication. Uses up to *90% less lubricant* than ordinary lubrication methods!

Lubricates any bearing on any machine with one of three types of fittings:

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Spray fittings for open and enclosed gears and chains.

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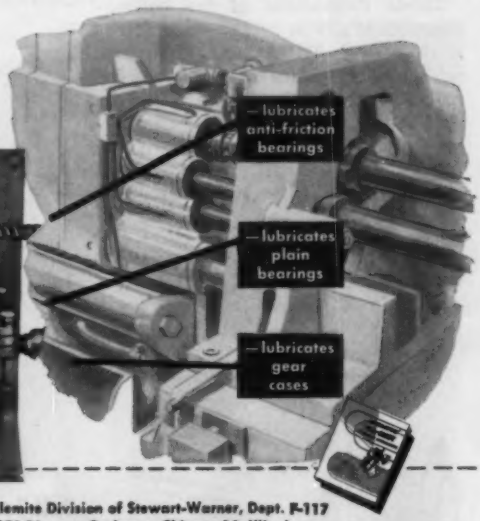

8 Advantages of the Alemite Oil-Mist System

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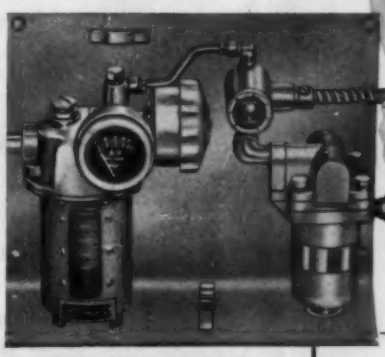
3. No guesswork. Bearings can't be overlooked, or over-lubricated!

4. Reduction of bearing temperatures. Acts as bearing coolant. Reduces bearing temperatures as much as 20°F.

5. Fewer types of oil. Reduces number of oils that must be stocked, handled and applied.

6. Elimination of downtime. All bearings are constantly lubricated while machines continue to operate.

7. Extension of bearing life. Life of grinding machine bearings have been extended from 400 to 7,000 hours!



8. As high as 90% less oil consumption. Usually consumes about 1/10th amount used by any other oiling method.

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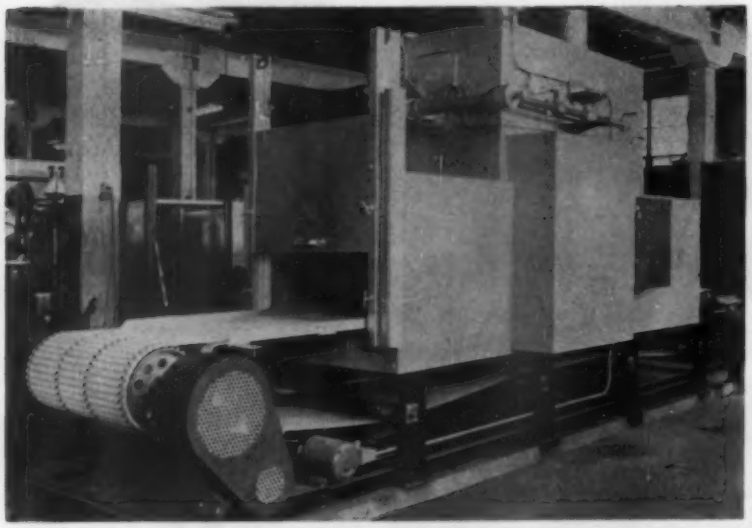


Grieve-Hendry Introduces Unique Continuous Belt Conveyor Oven

This continuous belt conveyor oven, designed to fit into automated lines, can be arranged for both automatic loading and unloading facilities. Unit, used for drying and baking processes, is gas fired and has a max temperature of 450 F. The belt is 36 in. wide, is driven by an electric motor, and is adjustable over a speed range of 2 to 10 fpm.

Inside dimensions of the baking chamber are 38 in. wide x 24 in. high x 15 ft long. The oven is equipped with counter-balanced doors at each end. A 6-ft extension on each end is for loading and unloading parts being processed. These ovens can be made for gas, electric, or steam heating; dimensions and other specifications can be changed to suit requirements.

Grieve-Hendry Co, Inc, 1401 W Carroll Ave, Chicago 7, Ill

Paymover Towing Tractors Available in Two Models

Model T-50 with 5000-lb drawbar pull and Model T-60 with 6000 are two-wheel-drive units. Models that will be introduced in the near future will include both two and four-wheel-steer, four-wheel-drive machines.

Units featuring torque-converter drive and automatic transmissions are designed for all industrial tractor-trailer operations. Wide variety of coupler attachments are available.

Frank G Hough Co, 928 Seventh Ave, Libertyville, Ill

Ball Table Transfer Stand For Gravity Conveyor Lines

Stand, designated Traffic Circle, can be used as a junction for 2, 3, or 4 lines, permits routing of objects from any one line to any of the others.

Unit consists of a circular ball caster table on three adjustable, removable legs. At outer rim of table are four support brackets that will accommodate conveyors up to 18 in. wide. Brackets are free to slide completely around the table so that any pattern of conveyor junction can be obtained.

M-H Standard Corp, 513-521 Communipaw Ave, Jersey City 4, NJ

Lightweight Hand Grinders Added to Cleco Air Tool Line

New 1500 Series for variety of metal grinding, sanding, and wire-brushing operations is available in a range of speeds and for several different wheel and guard mountings.

Use of magnesium alloy castings in design makes tool lighter in weight; lever thumb-tip throttle provides easy control without changing grip; special muffler handle reduces noise and serves as air exhaust.

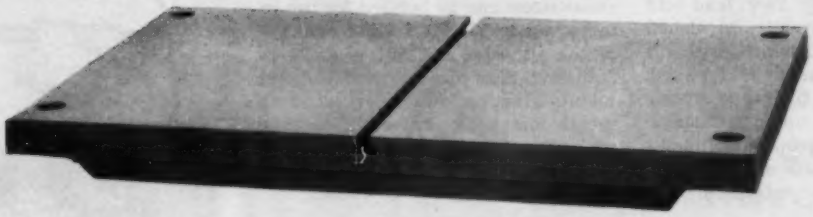
Reed Roller Bit Co, Cleco Air Tool Div, 5125 Clinton Drive, Houston 20, Tex

Hustler Electric Lift Truck Has Short Turning Radius

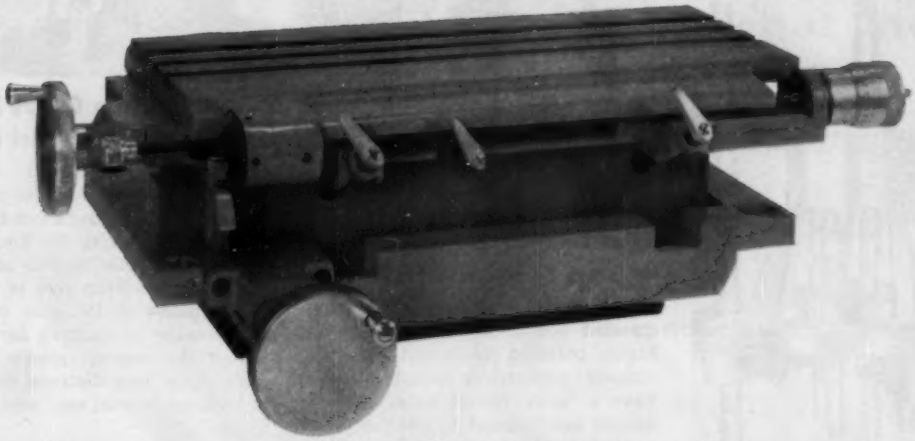
Electric lift truck, designated Pug, is available in 1000, 2000, and 3000-lb capacities and has been re-engineered to provide a smaller, more maneuverable truck at a lower cost. Measuring 60 in. long, the truck has a minimum turning radius of 52 in. For stacking operations, it has been shown that this truck requires approx 25% less aisle space than conventional equipment.

Truck has 4 forward speeds up to 6 mph plus reverse, dead-man brak-

NOW...CHOICE OF WORKTABLES



WITH THE KODAK CONTOUR



PROJECTOR, MODEL 14-6

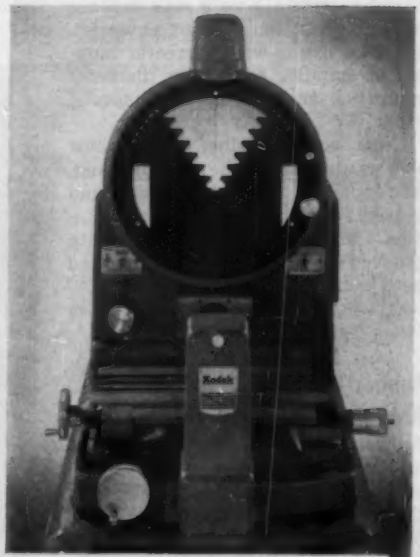
To meet a wide range of your optical gaging needs, the Kodak Contour Projector, Model 14-6, is now available with a choice of worktables: a flat, fixed staging table for production-line gaging and a movable worktable for horizontal toolroom measurements.

With the fixed table you have . . .

- An inexpensive instrument for checking long production runs quickly and accurately.
- Ease of adaptability to your own special staging fixtures. Fixtures are positioned in a milled T-slot, and the image is brought into focus by moving the fixture along the slot.
- Ample staging area for many kinds of parts, with 19⅜″ x 13¼″ table, throat clearance of 14¼″ and lens height of 6⅜″ above the table.

The movable table gives you . . .

- Easier fixturing and faster setups with table cross travel of 3″, vertical travel of 2″, focusing travel of 1½″.
- Rapid horizontal measurements to the order of .0002″ for toolroom as well as production use; simplified gaging of larger parts because there's no need to re-position.
- Slotted area—19¼″ x 8″—which permits use of standard fixtures for staging a wide variety of parts. Throat clearance is 14¼″; maximum lens height above the table is 4¼″; minimum, 2¼″.



With the Model 14-6 you get a high-quality precision optical system. A full 14-inch viewing screen covers a field of 1.4″ at 10× magnification. Accessory lenses provide a range of magnifications to 100×.

For additional data or a demonstration of this new Kodak Contour Projector, write to:

Apparatus and Optical Division

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

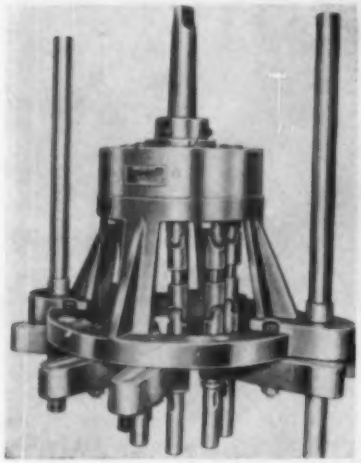
the KODAK CONTOUR PROJECTOR

Kodak

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS

ing and auxiliary electrical braking, and is powered by 24-v lead-acid batteries. It is normally furnished with adjustable pallet fork, with tilt range from 10° rear to 3° forward. Mast height can be furnished from a minimum of 60 in. up to any specified maximum. Special attachments include hydraulic side-shifting fork, boom crane, fork extension, and overhead guard.

Hustler Corp, Church & Elm St Plant, 17871 Elm Rd, Willoughby, Ohio



Universal Joint Drilling Head Available With Up to 12 Spindles

Unit furnished for up to No. 3 Morse Taper sockets allows a max drilling pattern of 14 in. without extension spindles. Heads with a greater number of spindles and larger diameter capacities are available on special order.

Case, cover, frame, and locator arm casting are made of aluminum. All spindles are hardened and ground with gears turned on spindles. Drive gear has heavy-duty grooved ball thrust bearings top and bottom.

Errington Mechanical Laboratory Inc, Staten Island 4, NY

Rubber-To-Metal Adhesive Provides Extra-Strong Bond

Adhesive for bonding cured natural or synthetic rubber to metal reportedly provides a bond so strong that the rubber will tear before it can be peeled from the metal.

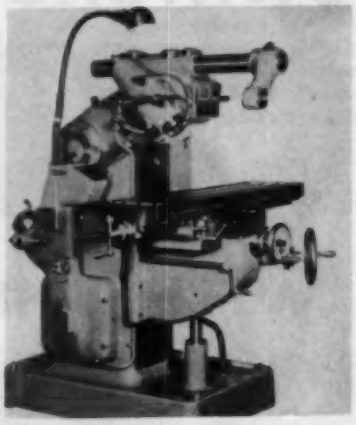
Product, designated Ray-Bond R-86001, cures in 24 hours at room temp (77 F minimum), reaches max strength after seven days. To reach max strength immediately, it may be cured in four hours at 120-140 F, giving better bond than at room temp. Rubber linings under peel or shear stress can be bonded for use in temps up to 100 F. Tensile strength of the adhesive is 2250 psi at 77 F. Adhesive may also be used to bond metal, glass, ceramics, or wood to metal, and as a protective coating, sealing and casting compound.

Raybestos-Manhattan, Inc, Adhesives Dept, Bridgeport 2, Conn

Nylon Collets Will Not Scratch Or Score Polished Surfaces

Non-Mar nylon collets are recommended for second operations on highly polished pieces and when machining nonferrous metals. Collets have a ⅛-in. center hole which is drilled and reamed to suit job. They are available to fit lathes, milling machines, Zagar fixtures, B&S automatics, and Warner & Swasey turret lathe. Prices start at $7.

Non-Mar Nylon Collet Mfg Co, 302-4900 Euclid Bldg, Cleveland 3, Ohio

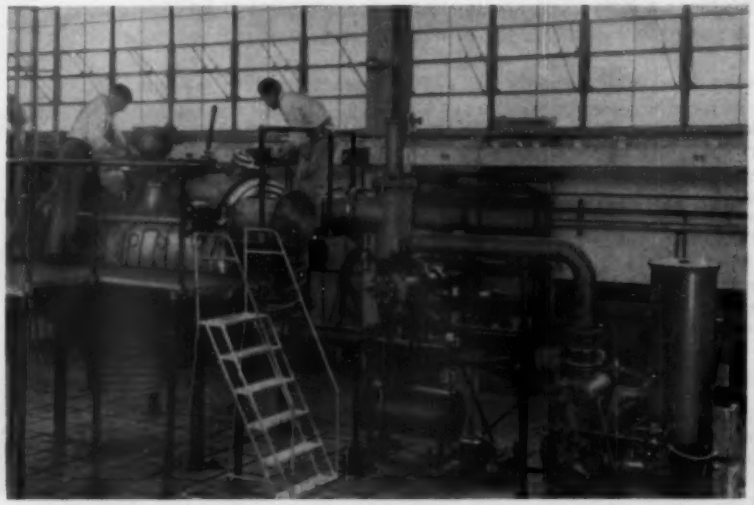


Swedish Machine Can Be Used As Vertical or Horizontal Miller

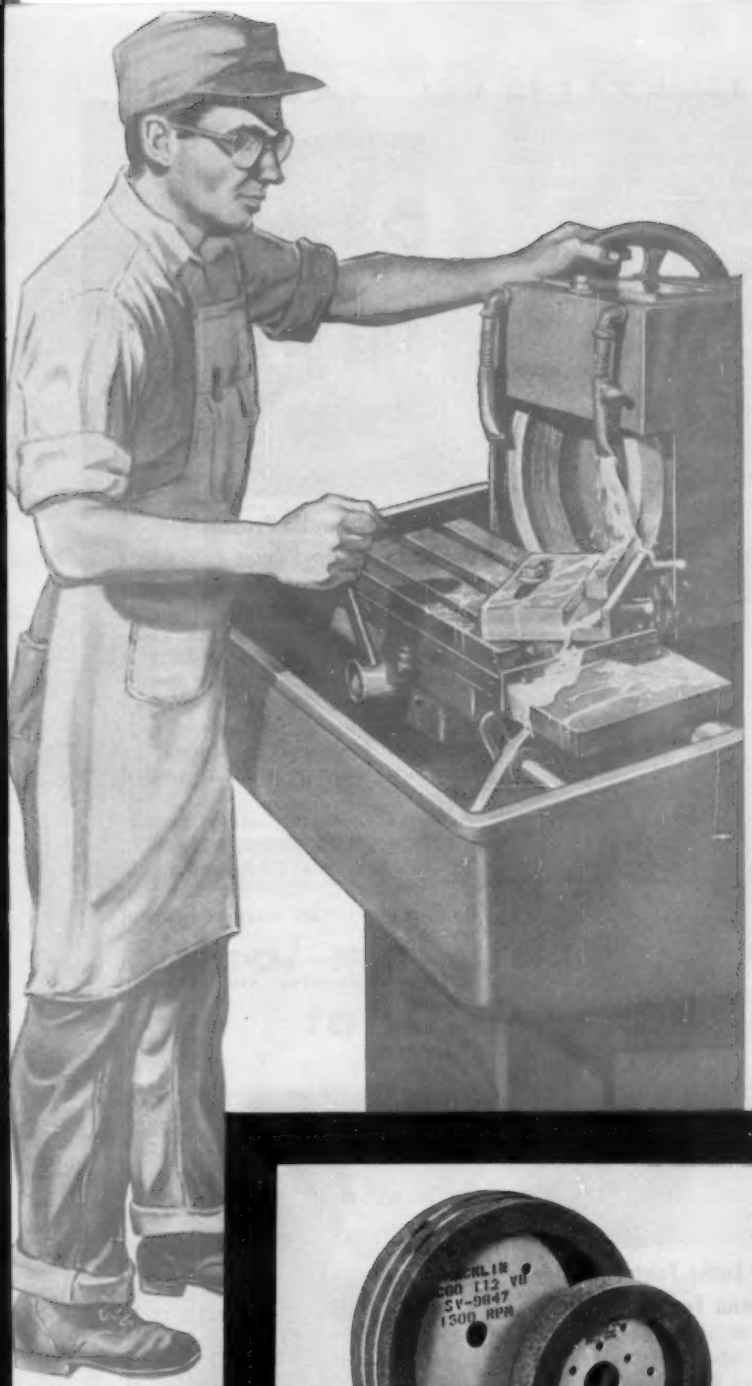
Abene Model VHF-2B combines working scope of vertical and horizontal millers. Spindle can be placed at right angle with the longitudinal line of the table and is adjustable for any angle from zero in the horizontal plane to 45° over the vertical. Because of slanting form of the top of the frame, spindle nose retains same long distance from table in both horizontal and vertical positions.

Table size is 40 x 10¼ in. Twelve spindle speeds range from 50 to 1300 rpm. Standard units are provided with No. 4 NST tapers.

Distributed by Aaron Machinery Co, 45 Crosby St, New York 12, NY



INDUCTION MELTING FURNACE, Model FIM-300, has an 8-ft long, 5-ft-dia chamber, a 2900-liter per sec diffusion-ejector pump, a 310-cfm mechanical pump, and a control center. It has a capacity of 50 to 300 lb. Four independently controlled charging cups are included. They are of the tipping type to allow regulation of rate and amount of additions—*Consolidated Electrodynamics Corp, 300 N Sierra Madre Villa, Pasadena, Calif*

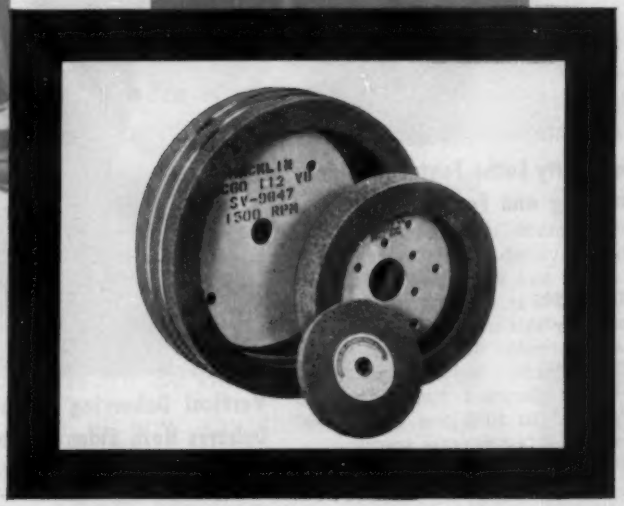


what MACKLIN V-8 wheels have saved for others is not near so important as what they will save you

IF YOU GRIND CARBIDE, you ought to try Macklin's newest "Wheel of Profit" on *your* job to get the FEEL of it. V-8 is easy on tools, easy on the operator's wrist. It cuts *fast* and *cool* without operator fatigue. Production goes up!

Here's proof . . .

V-8 non-slotted wheel *saved 10%* on purchase price over slotted wheel previously used . . . and customer reports "Though the V-8 wheel lasted only a couple of hours longer, *it produced almost twice as many tools as the competing wheel.*"



Write today for V-8 literature and wheel recommendations.
While you're at it, arrange for a trial demonstration. Just call your nearest Macklin distributor, or if you prefer, write direct.

MACKLIN company Dept. 70, Jackson, Mich.
MACKLIN OF CANADA, LTD., Harrow, Ont., Canada

Grinding Machine Operates in Vertical or Horizontal Position

Heavy-duty 10-in. abrasive belt grinder, Model PD-10, is especially suited for dry, flat surface grinding, polishing and deburring of castings, die castings, forgings, plastics, wood, ceramics, sheet metal and similar parts. It can easily be changed over from vertical to horizontal operating position. The 10 x 21-in. steel platen can be reversed top for bottom and side for side.

Multi V-belt drive, 5- or 7½-hp TEFC motor and dynamically balanced drive and driven pulleys insure smooth operation. Automatic air or spring belt tensioning is available (automatic air tensioning is recommended for longer belt life and better finish). Standard belt speed is 3800 sfpm, but other speeds are available. Bulletin 331-T

Hammond Machinery Builders, 1618 Douglas Ave, Kalamazoo, Mich

Electrical Discharge Machine Cuts Intricate Outlines and Contours

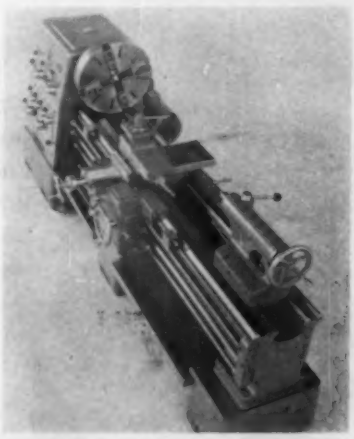
The Mark III Sparcatron electrical discharge machine is capable of cutting intricate outlines and contours in hardened metal, particularly in tool and die making. Work blank and an unhardened electrode, shaped to the desired outline, are submerged in a dielectric bath in a tank that surrounds them on the machine table. Work is secured to table. Electrode is held in chuck in machine head and is automatically lowered, leaving minute gap between it and work surface.

A capacitor discharge unit sends an electric discharge through electrode at ultra-high repetitive frequency to "spark machine" the workpiece. Gap distance is maintained by a servo. Head stroke is maximum of 3 in. for each setting. The 20 x 13-in. table will hold up to 500 lb.

Control can be manual or automatic. One to four machines can be operated from one main control power unit. Since machines are equipped with micro switches, machines can be left unattended until operating cycle is complete.

Available in addition is a voltage regulator, tradenamed Porto Pac, designed to provide constant voltage for portable power tools.

Distributed by Easco Products, PO Box 587, Ypsilanti, Mich

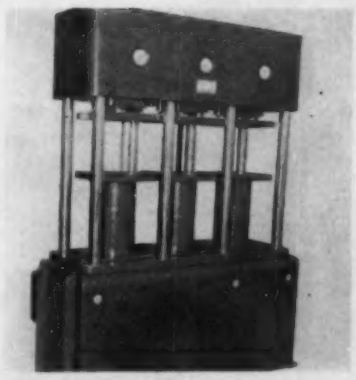


Heavy-Duty Lathe Features Wide Threading and Feed Range

German-made Barer-Meuser M III L lathe is available with 20, 24, or 28-in. swing and with center distances of 40 to 240 in. Among the features offered by this new line are 262 different threads; 88 different longitudinal feeds; 88 different cross feeds; 12 forward speeds in two ranges, 22 to 1000 and 32 to 1400 rpm; and 6 fast reverse speeds.

Machine can be equipped with hydraulic tracing attachments with a guaranteed working accuracy of ±0.0002 in. A larger series, the M IV L, is also available. These larger units have swings of 24, 28, and 32 in.

Distributed by Barer Engineering & Machinery Co Ltd, Champlain, NY

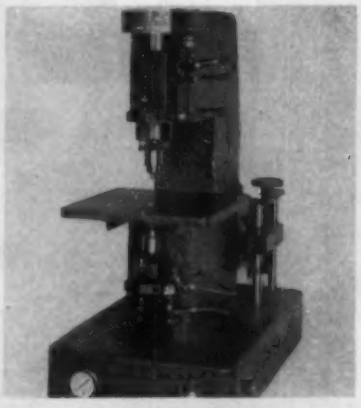


Multiple Hydraulic Presses Use Shop Airline Power

Presses for molding rubber, plastic, or ceramic are available as single, double, triple, or quadruple units. Each section has capacity of 50 tons; platens are 13 x 13 in.; max operating for each is 5000 psi. Temp range is 150 to 550°; ramstrokes and daylight openings are 13 in. Models are furnished with or without heated platens.

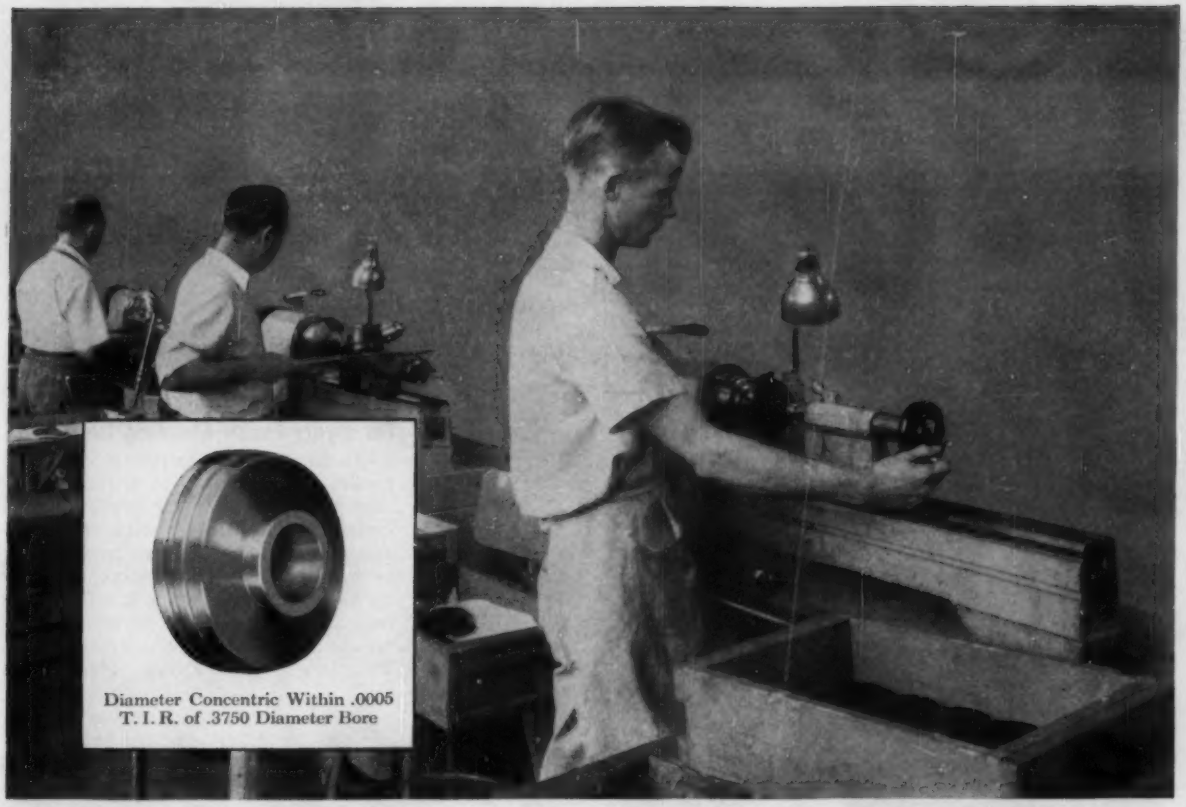
Original cost for either double, triple, or quadruple presses is said to be less than usual because a single unit houses all controls. Multiple stations provide for staggered curing cycles.

Allied Engineering & Production Corp, 2421 Blanding Ave, Alameda, Calif



Vertical Deburring Machine Deburrs Both Sides of Holes

New machine makes it practical to deburr both sides of holes in flat and thin sections. After top spindle has finished deburring one side, it retracts and bottom spindle then deburrs other side. On thicker sections, a switch is provided to bring both spindles together at same time. Holes



Signal manufacturer holds tolerances to .0005" on production!

Century-old Gamewell is famous for its exacting work in turning out emergency signaling and fire alarm systems. In recent years credit can be attributed to the Rivett Precision Lathes on which much of this work is performed.

You can improve your reputation for accuracy, too, with Rivett 918 "Steelway" Lathes. Write for Bulletin 918—get the evidence of how simplified tooling increases output with closer tolerances, reduced set-up time and minimum rejects.

Gamewell Co., Newton, Mass., Reports:
"We like Rivett lathes because of their versatility. No matter whether we are doing a fine precise lathe job, a turret job, or a simple reaming job, we put it on a Rivett lathe, if the job is within the capacity of the machine."

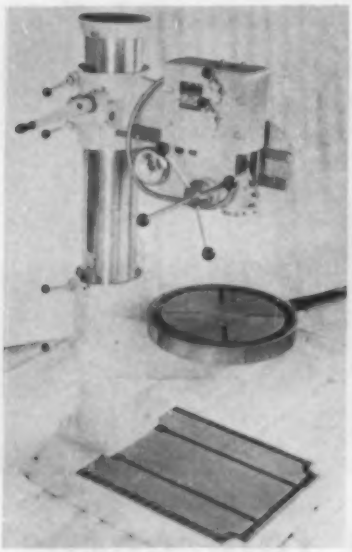
RIVETT LATHE & GRINDER, INC.
Dept. AM-11, Brighton 35, Boston, Massachusetts

RIVETT
"STEELWAY" LATHES

1/32 to ½-in. dia reportedly can be deburred in less than half the time of previous methods.

Machine is air operated through double-acting cylinders and foot controlled, leaving both hands free to handle work.

Model Machine Co, Inc, 4729 Hawthorne St, Philadelphia 24, Penna



Radial Drilling Machine Has 1⅛-in. Capacity in Steel

Essbeco RD 25 radial drilling machine is made in Sweden and is designed for toolroom or repair shop work—wherever the type of work changes frequently. There are 8 spindle speeds, ranging from 100 to 1280 rpm. Table is 19¾ in. in diameter and is provided with T-slots and oil groove. Max distance from column to center of spindle is 27⅜ in.; min distance, 9¼ in. Full line of accessories available.

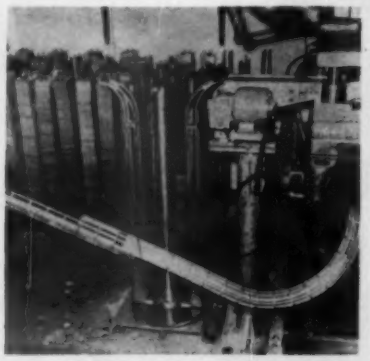
Distributed by Barer Engineering & Machinery Co Ltd, Champlain, NY

Portable Grinders Incorporate Built-In Safety Guard Insert

New type of grinding wheel mounting eliminates need of reinforcing rings, pronged anchor bushings, and the use of individual mounting nuts.

Grinding compound is locked in at three points—between the extruded prongs and the outside guard, and between prongs and center nut. It is so completely surrounded on the upper outside diameter that it reportedly does not take away any grinding surface in life of wheel.

Carroll Pressed Metal, Inc, Worcester, Mass

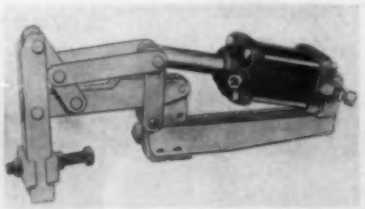


Stacking Chutes Carry and Stack Stampings up to 20 ft From Press

New line of stacking chutes is designed to carry and stack stampings up to 20 ft away from the presses. No limitation exists on the maximum thickness or size of the stamping. Minimum thickness is established at approx 0.005 in. or any thickness which can support its own weight when stood on edge.

The backing-up problem is eliminated by the provision of a one-way trap. Chutes are mounted onto the die shoe of the press bolster and are adaptable to all types of OBI presses, high production presses and dieing machines. Maximum load capacity is 5000 lb.

Clark Industries, Delaware, Ohio



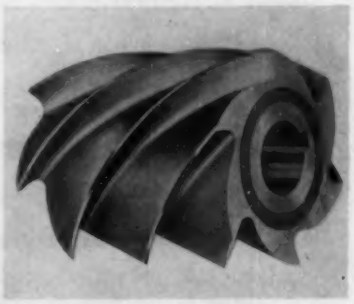
800-LB AIR CLAMP added to Knu-Vise line is available in two standard models: the AO-800 toggle clamp for conventional clamping, and the AODT-800 double-toggle type for difficult mounting situations—*Lapeer Manufacturing Co, 1150 W Baltimore, Detroit 2, Mich*

Sluriator Equipment Available For Hydro-Finish Cleaning Units

Sluriator, designed to prevent solid packing of abrasive at bottom of tank after overnight shutdown, eliminates need for mechanical pump and auxiliary equipment, and can be adapted to conical-bottom tanks by means of a conversion kit. Drawings, instructions, fittings, and materials are available to convert any Pangborn Hydro-Finish cleaning unit.

Device consists of a 4-in.-dia compressed air distributor set between two heavy gage Wear-Resist alloy circular plates. Two such fittings are installed at base of sloping side walls of the abrasive slurry tank. Agitating air strongly sweeps tank bottom and spirals through body of the liquid to provide rapid and thorough agitation. Only equipment required is a take-off from the regular 80 to 90-lb compressed airline necessary to operate the nozzle, and a needle valve to regulate airflow through the Sluriator heads at 6 to 10 cfm.

Pangborn Corp, Hagerstown, Md



Dual-Purpose Milling Cutters Cut Aluminum and Ferrous Metals

New line of high-helix plain milling cutters, designed for cutting both aluminum and ferrous metals, has a 52° left-hand helix and 12° hook. The high helix angle prevents "hogging in" when cutter is entering or

What's the job?

We've got the file!

Flat files and round, files for wood, files for metals, files for plastics—we make a file in the exact shape, size and cut to meet your every need.

Pictured above are only a few of our files—a tiny sampling of the 6000 Nicholson and Black Diamond varieties available through your Industrial Distributor.

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NICHOLSON FILE COMPANY, 29 ACORN STREET, PROVIDENCE, R. I.

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

BLACK DIAMOND U.S.A.

NICHOLSON and BLACK DIAMOND FILES

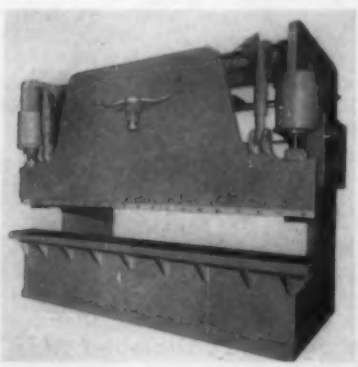
A FILE FOR EVERY PURPOSE

leaving the workpiece. This feature makes the tool ideal for cuts on thin springy pieces or intermittent cuts on frail parts. Design reportedly offers an extremely free cutting action.

Cutters are supplied with cutting edge clearance angles suitable for the material being machined. Cutter tooth and chip spaces are ground and polished to facilitate chip removal. Tools are available in five sizes, ranging from 4 to 8 in. in width. Bulletin X-3A.

Goddard & Goddard Co, 12280 Burt Rd, Detroit 23, Mich

INDUCTION HEATING motor-generator sets of new Ther-Monic line have capacities of 30-50 kw and 100 kw. Photo shows a Ther-Monic 100-kw, 10,000-cycle motor-generator with its master control and heating station—*Induction Heating Corp, 181 Wythe Ave, Brooklyn 11, NY*



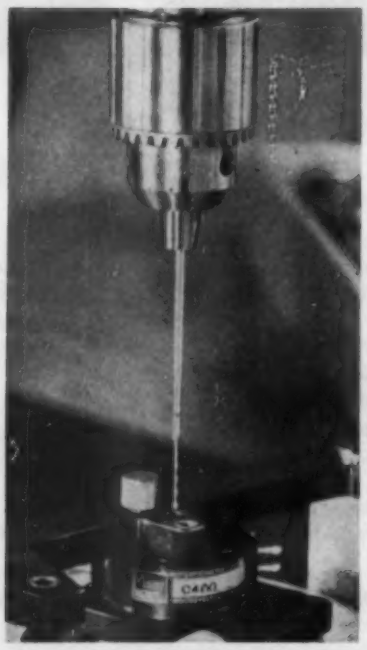
Hydraulic Press Brakes Handle All Metal Forming Operations

New line of presses, tradenamed Longhorn, features capacities of 160 to 1500 tons. Special presses built to specifications are also available.

Designed to handle all metal forming operations, presses can also be used for trimming and punching vacuum-formed plastics as well as other materials. All units are equipped with NEMA 12 or JIC standard electrical circuits. Catalog available.

Perry Co, PO Box 2057, Waco, Texas

VIBRATION METER, known as the Davey Hand Vibrograph, is a compact, self-contained instrument for making permanent records of machinery vibrations on a continuous paper chart. It measures amplitude and frequency and offers magnifications of 40, 20, 10 or 5:1—*Vibroscope Co, PO Box 97, Glenford, NY*

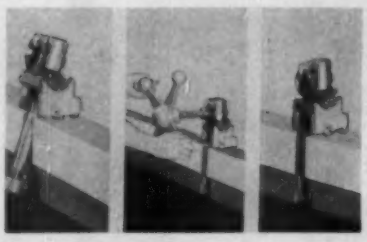


Ritmar Miniature Tool Drills Small, Accurate Holes

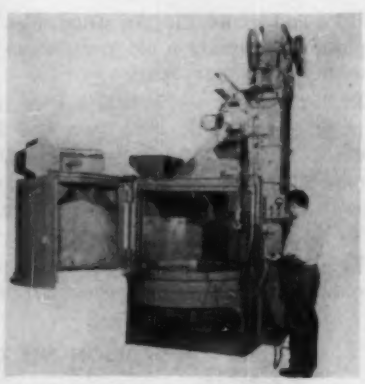
Tool called Mindril has a special gripping mechanism which permits easy changing of dull or broken tools. Each Mindril is built to hold a single size drill. Usually with drills of this size the drill is soldered to an extension rod—and when drill broke, the whole tool had to be discarded.

Made of high-grade tool steel, heat treated for strength and durability, the Mindril is designed to hold individual drill sizes ranging from #80 to #57 or 1/64 to 1/32 in. Drill number is etched on shaft. Diameter of tool is ⅛ in., allowing it to be used conveniently with drill bushings. It is said to be ideal for precision drilling of instrument parts and other small mechanisms (illustration shows tool being used to drill tap holes in a potentiometer).

Ritmar Corp, 183 New York Ave, Huntington, LI, N Y

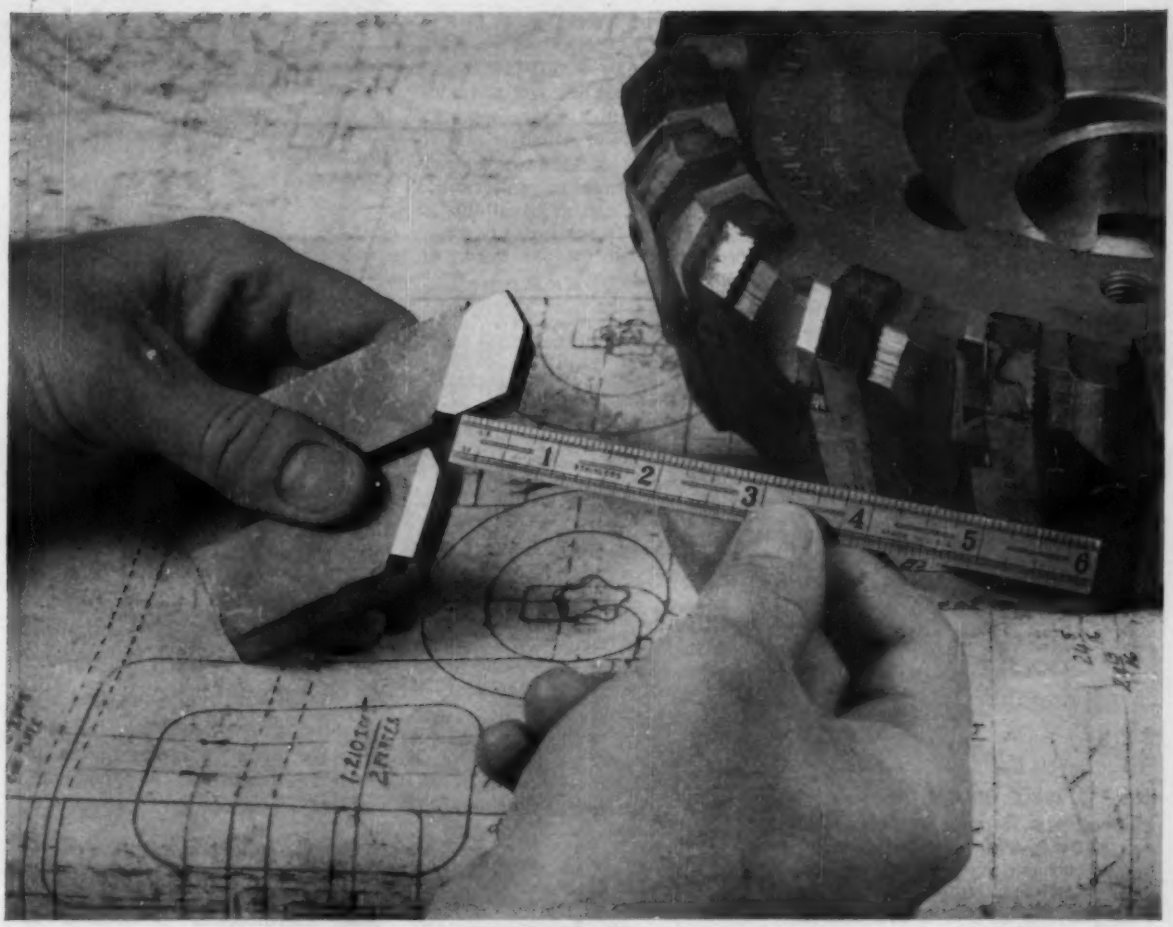


CLAMP for mounting punch dies to press slides attaches to press slide, reduces die mounting time to seconds. Clamps are available in 10 and 15-ton capacities; minimum of four clamps recommended for each slide. Tightening sequence (illustrated) is rapid and extremely simple—*Clearing Machine Corp, Div of U S Industries, Inc, 6499 W 65 St, Chicago 38, Ill*



Rotoblast Cleaning Unit Has 48-in.-Diameter Rotating Table

Small 4-ft Rotoblast table room is designed for a wide range of cleaning operations on castings, forgings and stampings up to 48-in. dia and



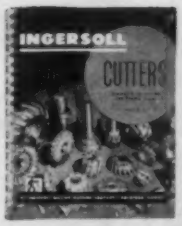
Ingersoll Heavy-Duty Shear Clear Face Mill designed for cast iron or steel. Size of bevel is varied to suit depth of stock.

What Does Your Scrap Barrel Show?

Do you get over ½" of blade wear? A look into your scrap barrel will show that many blades were wasted because of cracks, misuse, improper design or misapplication of the cutter and grade of carbide. You probably can't tell why these blades failed prematurely because so many variables are involved.

We are used to working with these variables and can help you reduce your tool costs. Part of our product is the continuous counsel of your Ingersoll representative and our cutter engineers. They will consider the machine, material, speed, feed and finish requirements before recommending the tool which will do the best job at the lowest cost.

We will welcome an opportunity to tell you more about this service. Write:



If you do not have a copy of this book, write us and we will send you one. It describes in detail the complete line of Ingersoll inserted blade milling and boring tools. Ask for Catalog 66K.

CUTTER DIVISION

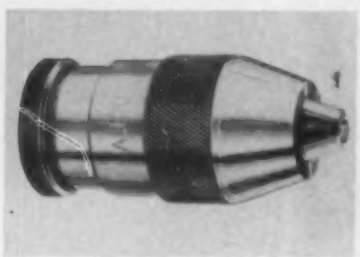
THE INGERSOLL MILLING MACHINE COMPANY

505 FULTON AVENUE ROCKFORD, ILLINOIS

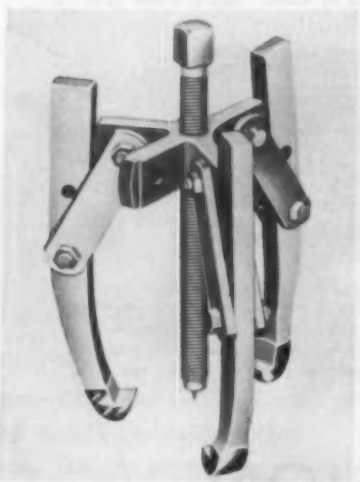
24 in. high, as well as plastic and composition materials. Unit handles loads up to 4000 lb and is equipped with a cast labyrinth abrasive-seal system which makes cabinet abrasive-tight without rubber gaskets.

Single door opens to expose half of the rotating table. An overhead wheel, powered by 10-hp motor, throws 15,000 lb of abrasive per hr. A 15-hp motor is available which will throw 22,000 lb per hr. For maximum abrasive efficiency, a self-contained automatic elevator and separator continuously clean used abrasive for recirculation to the abrasive discharge wheel.

Pangborn Corp, Hagerstown, Md



KEYLESS DRILL CHUCK, tradenamed Validus, is a German product which is reported to offer unparalleled accuracy of concentricity. Sealed ball bearings allow for easy opening and closing by hand. Unit is available in four sizes. Bulletin available—*Distributed by R B Tool Co, 785 N Broadway, White Plains, NY*



Combination 2-Jaw or 3-Jaw Puller Features Power-Pitch Thread

Grip-O-Matic jaw puller offers a choice of either two or three points for gripping. Unit can be changed from 2-jaw puller to a 3-jaw model by simply shifting one jaw and adding another. Puller has company's power-pitch thread which is said to increase power 32%. Jaws tighten as pressure is applied and cannot slip off work. Units are available in sizes from 6 to 14-ton capacity.

Owatonna Tool Co, 383 Cedar St, Owatonna, Minn

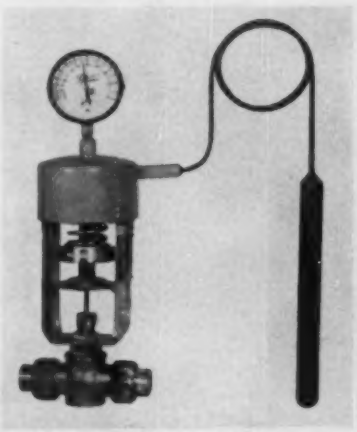
ABRASIVE BELT SWINGFRAME GRINDERS, available in heavy-duty (illustrated) and extra heavy-duty models, are furnished in wide range of power, belt widths and lengths, and can be combined with other machines for special applications. Bulletin 110—*Grinding & Polishing Machinery Corp, 2530 Winthrop Ave, Indianapolis 5, Ind*

Portable Plating-Solution Filter Provides Increased Capacity

Compact plating solution filter, designated Dincalux, has a capacity of up to 900 gph free flow (or about 600 gph with carbon charge). Unit measures 15 x 15 x 28 in., yet has 3.5 sq ft of filter area provided by 16 Perspex plastic plates.

New design has solution entrance at bottom of unit and discharge at top to effectively prevent liquid from bypassing the filter. It may be used for intermittent or constant filtering or transfer pumping.

Hanson-Van Winkle-Munning Co, Matawan, NJ



Self-Operated Temp Regulator For Metal Finishing Processes

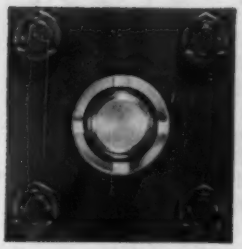
Model PA-2 is designed to provide accurate temperature regulation in plating, bonderizing, anodizing, cleaning, pickling, and rinsing solutions.

Unit is equipped with a handwheel to adjust temperatures within the limits of a selected range. Easily-read thermometer is located at crown. Model is available in seven valve sizes from ¼ to 1½ in.; several bulb sizes are also available. Descriptive brochure contains application data.

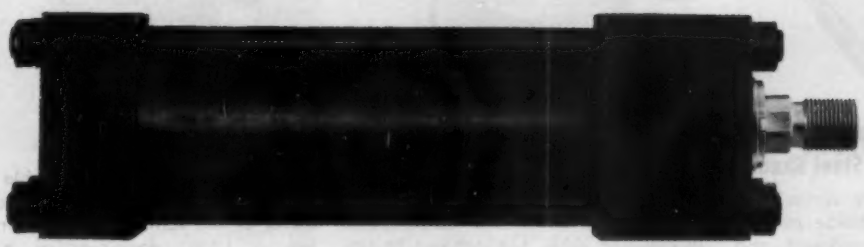
Robertshaw-Fulton Controls Co, Fulton Sylphon Div, Box 400, Knoxville, Tenn

Portable Broaching Machine Permits Assembly Line Broaching

Portable unit called the Porto-Broach consists of a power cabinet and a hand-held, gun-type broach puller. Model PM2509 develops 5000-lb pulling capacity with a 9½-in. stroke and is designed for 3/16 through ⅝-in.-dia broaches. Model PM5009 develops 10,000-lb pulling capacity with 9½-in. stroke and will



Made for the tough buyer



The discriminating engineer is intolerant—intolerant of anything but the very best in his plant and in his product.

For these tough buyers Hannifin cylinders are made. Into these cylinders go original, exclusive features of design, precision manufacture, and the ability to outperform others with the very minimum of maintenance.

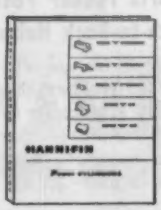
You would expect to pay more for Hannifin cylinders. Actually there is no price premium. We can deliver them to you promptly in the sizes and mounting styles you require.

AIR AND HYDRAULIC

HANNIFIN

POWER CYLINDERS

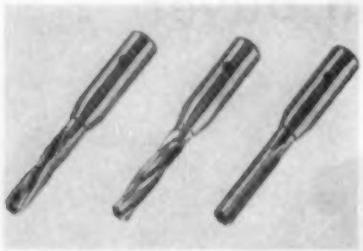
Write for your copy of this new Hannifin Cylinder File—complete, easy-to-use, easy-to-order-from information on five lines of Hannifin cylinders. Hannifin Corporation, 517 South Wolf Road, Des Plaines, Illinois.



accommodate ¾ through 1½-in.-dia broaches. Tolerances may be held to ±0.0002 in. Stock removal up to 1/32 in. in 2½-in. length of cut can be broached in a single pass using company's Heli-Cut broaches.

Both models are mounted on the caster-mounted power cabinet. In the mounted position, gun may be used for conventional internal pull broaching. Full line of accessories and broaches available.

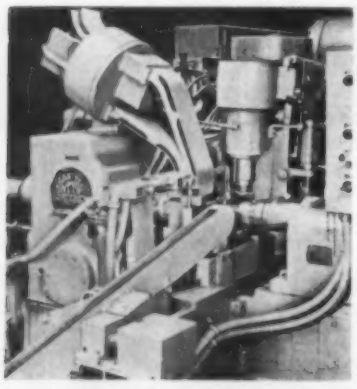
Pioneer Broach Co, Engineering Dept, 6434 E Telegraph Rd, Los Angeles 22, Calif



Solid-Carbide Stub Reamers Have Hardened and Ground Steel Shanks

These stub reamers for screw machines have a solid-carbide reamer portion brazed into hardened and ground steel shanks. They are available in sizes from 0.060 to 0.510 in. Sizes from 0.060 to 0.115 in. inclusive have a 45° cutting chamfer; larger sizes have a standard radius chamfer.

Rotary Tool Industries, Inc, 4461 W Jefferson, Detroit 9, Mich



Automatic Parts Feeder Positions Parts for Back-to-Back Hobbing

Designed primarily for use with company's Model 1445 Hobber, this feeder is particularly applicable to gears with extended hubs and similar parts which tend to support each other when mounted in pairs on an arbor. Parts feed through the drum unit in which a rotating arm reverses every other part and thus positions the parts back-to-back as they go into the hobber.

New loading method practically doubles the output of a single-spindle hobber. Hob life for a given production run is extended substantially by back-to-back hobbing as the hob enters the cut only once instead of twice.

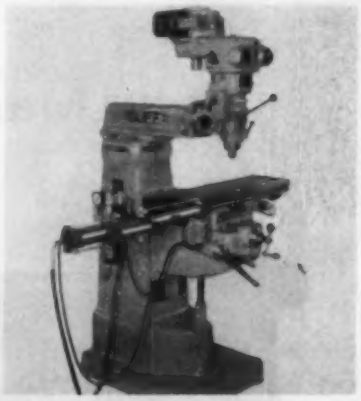
Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich

Mist Coolant System Increases Cutting Life, Speeds Production

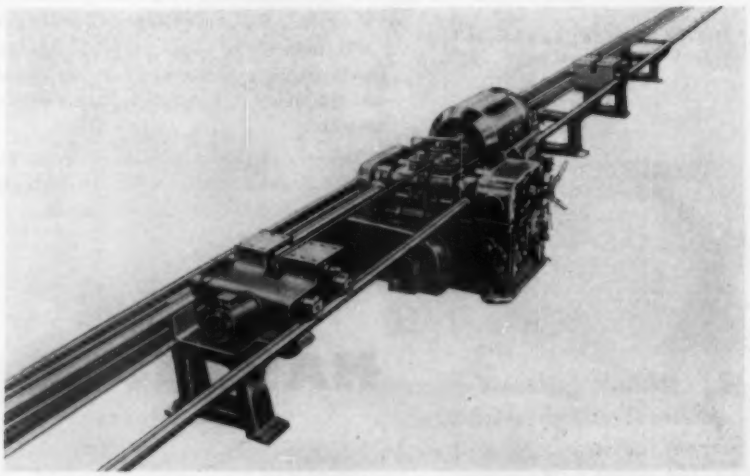
Coolant system designated Tool Mist is recommended for use on all types of machine tools. Coolant can be applied in combination with air in such a way that coolant actually dissipates in the air; no coolant pan is needed.

Unit is available with a 1-gal container and 1 or 2 outlets. A 3½-gal model is available with up to 4 outlets. There are separate controls for air and liquid to provide correct spray for any cutting operation. The flexible steel nozzle will hold any flexed position. The 1-gal model sells for $28.85.

Wesco Tool & Mfg Co, 2820 San Fernando Blvd, Burbank, Calif



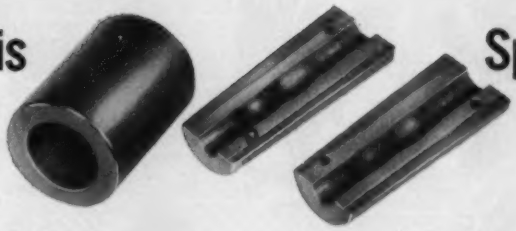
VERTICAL MILLER is now available with a Bellows Air Feed for the longitudinal travel of the table. Model illustrated has a 12-in. double-action Hydro Check, with a 15-in. air motor cylinder. Air motors and Hydro Check units can be supplied for 1½ to 18-in. travel—*Duff Machine Co, 31 Wingate St, Haverhill, Mass*



CENTERLESS BAR-TURNING MACHINE is being manufactured under a license from Sir James Farmer Norton & Co, Ltd, Manchester, England. It can be used for rough or precision turning of ferrous and non-ferrous bars, including bars of titanium and uranium. Ovality tolerances of ±0.00025 in. and max dia variation of ±0.001 in. in any 20 ft length of bar can be achieved with a finish comparable to centerless grinding—*Sutton Engineering Co, First National Bank Bldg, Pittsburgh 22, Penna*

This KENNAMETAL* Solid Die

Replaced this Split Die



in Producing these Grinding Wheels

PRODUCTION UPPED 50% ...DIE COSTS PER PIECE CUT 75%

The small abrasive grinding wheels produced by Mounted Points Company, Inc., of Garden City, Michigan, represented a real production problem.

In the operation, aluminum oxide with a clay binder was compacted into parts ¼ inch in diameter, and from ¼ to 1 inch long. Costly split steel dies wedged into a tapered case, on a manually-operated press, had been used. Parts frequently seized, due to wear on the I.D., and could not be removed without opening the die. Even then, breakage was extensive.

From 40 to 50 parts per hour were produced from each die. Because of the extremely abrasive action of the aluminum oxide grits, die life was only 2,000 to 2,500 at which point the die was worn approximately 1/16 inch larger in diameter.

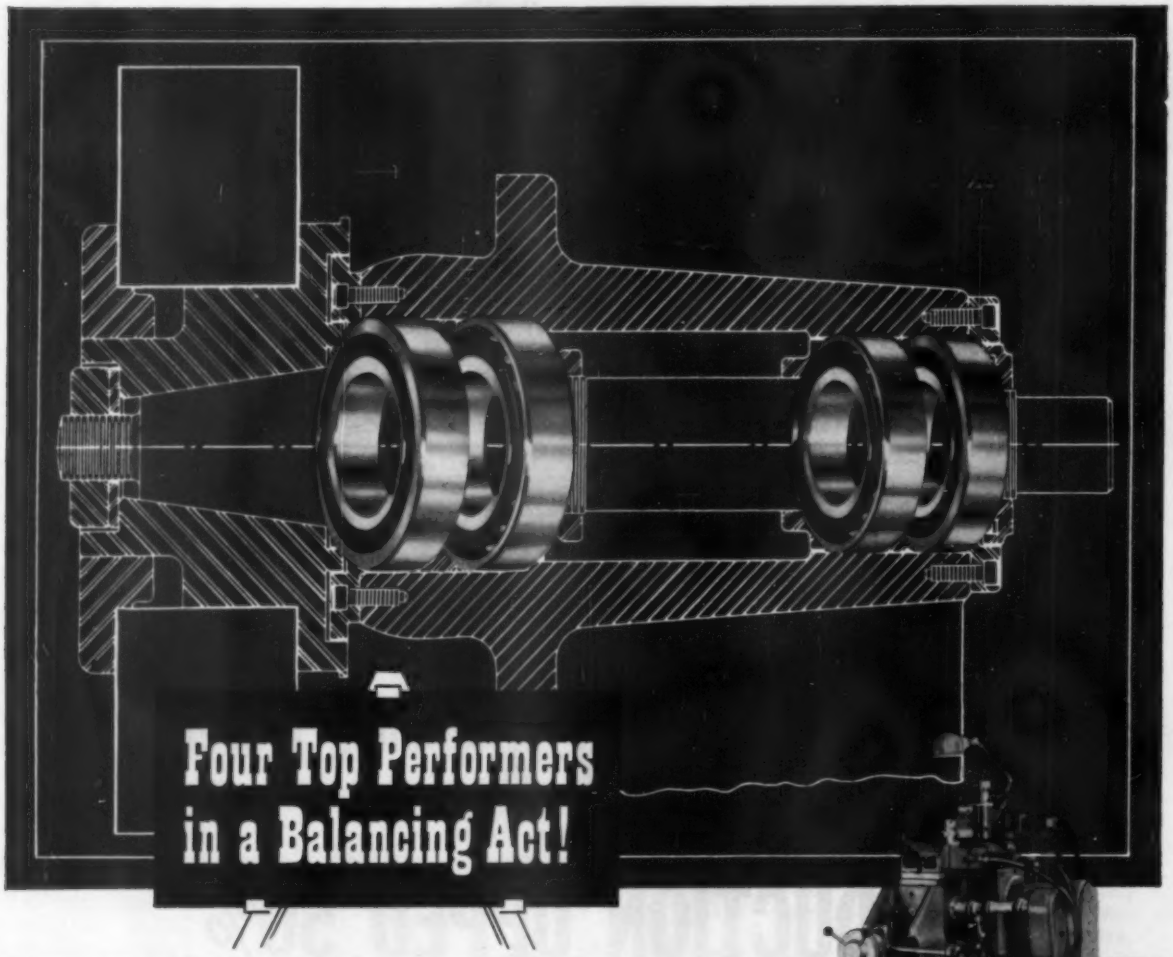
The L & H Die & Tool Company, of Oak Park, Michigan, fabricated a solid cylindrical die for the operation. It was made of Kennametal Grade K11, was .260 inch I.D. x 3¼ inches long, and was housed in a 2¼-inch alloy case.

With this die, production jumped to 60-70 parts per hour by eliminating the costly operation of assembly and disassembly of the tapered steel die for each piece produced; also by virtual elimination of rejects due to jamming. The die with Kennametal produces 15,000 pieces with only .005-inch wear on the I.D. Parts are easily ejected, breakage of product is held to a minimum, and sizes are held more constant. The original grind, plus four regrinds, produced 90,000 pieces. The die was then reworked to produce a grinding point ½ inch larger.

If you have a die application where loads are light, abrasive conditions are severe, and dimensional stability is important, Kennametal Grade K11 may solve your problem. Consult your die supplier, your Kennametal Die Engineer, or write: KENNAMETAL INC., Latrobe, Pennsylvania. C-3098

*Trademark

INDUSTRY AND KENNAMETAL ...Partners in Progress



Four Top Performers in a Balancing Act!

To assure true spindle balance, close running accuracy, and vibrationless performance, Royal Master mounts the massive, heat-treated alloy work wheel spindle of its TG-12 centerless grinder on four Fafnir Super Precision Ball Bearings. The spindle assembly itself is mounted directly into the normalized, stress-relieved, close-grained grey iron head stock.

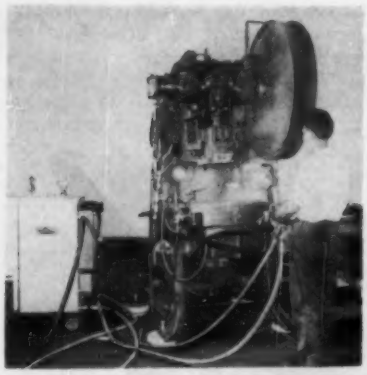
Besides providing proper balance and smooth spindle operation, the Fafnir Preloaded Super Precision Ball Bearings used in the TG-12 eliminate spindle warm-up time—an important feature where the machine is used intermittently. Moreover, relubrication of the bearings is never required. They are lubricated for life when the machine is assembled.

This Royal Master bearing application is a typical example of the Fafnir "attitude and aptitude"—a way of looking at bearing requirements from the designer's point of view and coming up with the right bearing to fit the need. Perhaps the Fafnir approach can be of help to you in finding more economical and satisfactory answers to bearing problems. Write The Fafnir Bearing Company, New Britain, Connecticut.

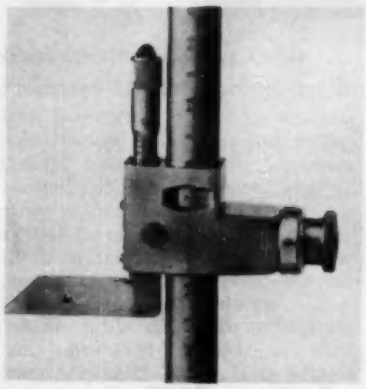
Royal Master TG-12 Centerless Grinder, Fafnir equipped, is designed for thru-feed, plunge feed, and infeed grinding. It has successfully ground materials ranging from plastics to tungsten carbide. Features include accessibility of both sides of wheel from operating position, for high output and fast checking.

◀ Fafnir preloaded, angular-contact, super-precision ball bearings with composition or bronze retainers are made to highest industry-approved tolerances. Single or duplex bearings like this are used widely on spindle applications.

FAFNIR
BALL BEARINGS
MOST COMPLETE LINE IN AMERICA



STEAM CLEANER, the Speedylectric Steam-Jet Cleaner, has been improved to offer a 1/3 reduction in electric power demand and consumption. Normal operation consumes only 15-18 kw per hr. Unit is reported to be entirely free from fire and explosion hazard—*Pantex Mfg Co, PO Box 660, Pawtucket, RI*



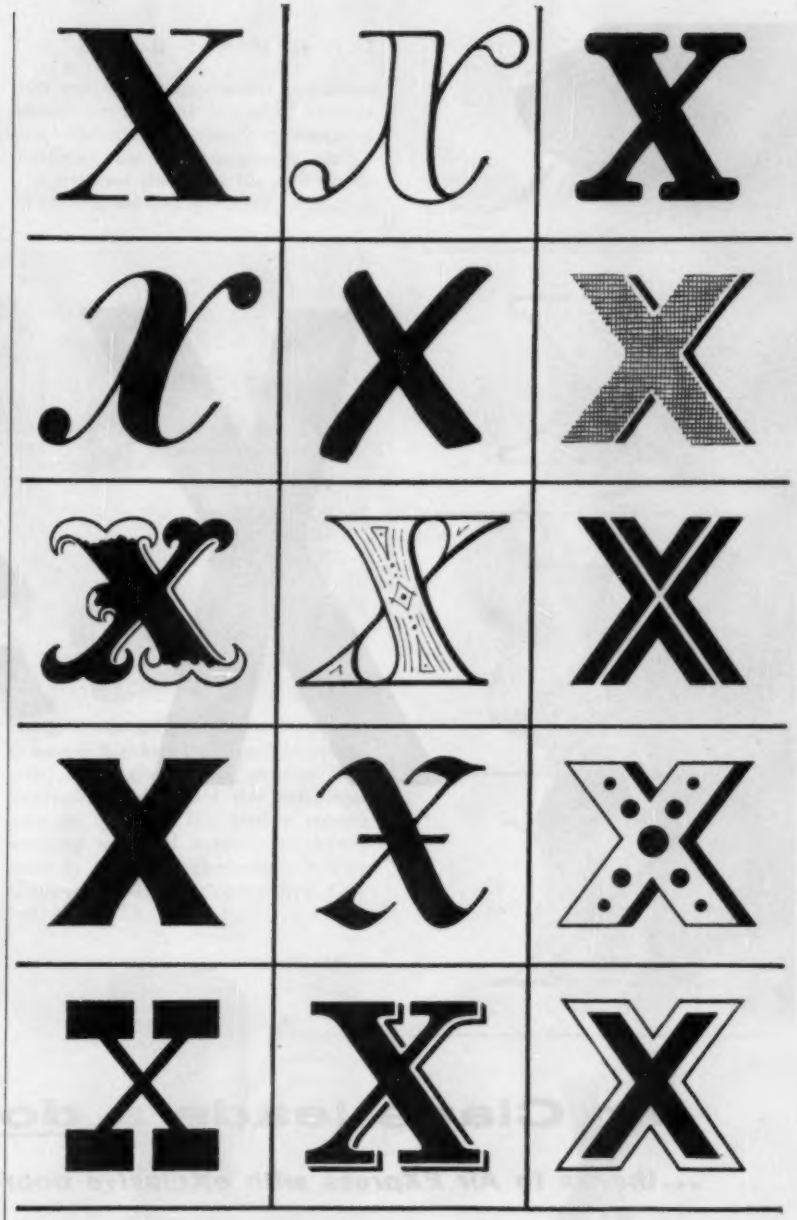
Micrometer Height Gage

Absolute positive action is controlled by indexing at 0.500-in. intervals by means of hardened steel balls set in stainless steel column of the newly designed Microball. Intermediate settings are made by operating micrometer gage incorporated in the unit, reading direct to within a tolerance of 0.0005 in.

Gage is easily read without magnifying devices, eliminates vernier scale.

Foster Supplies Co, 6122 Milwaukee Ave, Chicago 30, Ill

Selective solvent called Sonic-Solve 113, formulated for use in ultrasonic cleaning equipment, has power to remove contaminants without affecting plastics, decals, numbers, insulating varnishes, etc. This nonionic, non-hydroscopic, rapid-drying

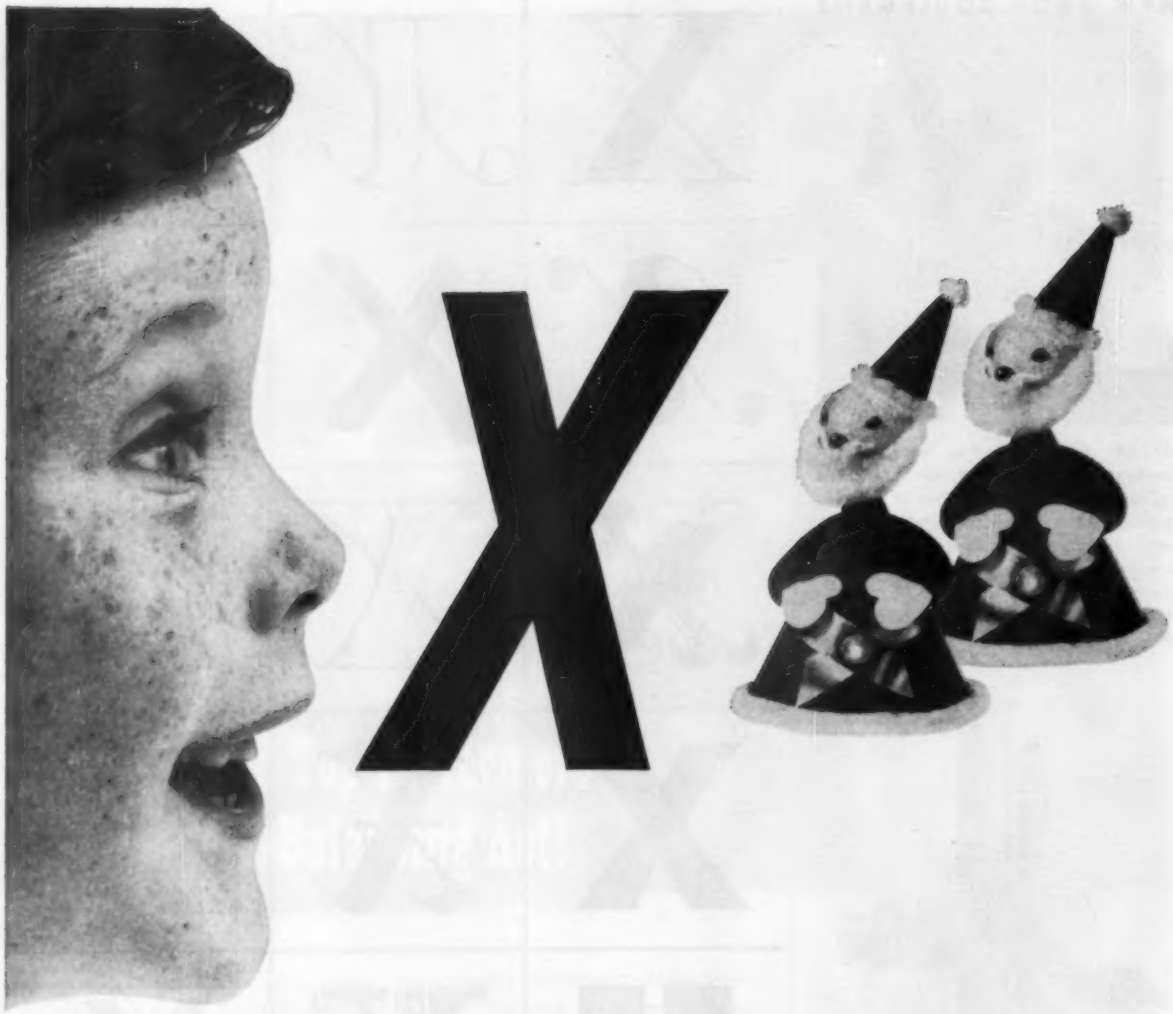


What does "X" mean to you?

- ☐ The unknown
- ☐ Kiss in a love letter
- ☐ Multiplication sign
- ☐ Where the treasure is buried
- ☐ Last letter in "Sex"
- ☐ Railroad crossing
- ☐ Legal signature

And now, for a modern "X" that expands your vision of the future,

TURN TO THE NEXT PAGE... ⟶



Mr. Claus leads a double life

...thanks to Air EXpress with eXclusive door-to-door delivery!

The gentleman in the red suit calls on the toy industry before August. But one smart manufacturer discovered how to e*X*pand his selling season *almost to the night before Christmas!* While competition slacked off, he sought and delivered new orders...he refilled old orders . . . *overnight, anywhere in the country!* It was like adding an e*X*tra Christmas season. And it was done by using Air EXpress, the only complete door-to-door air shipping service to thousands of cities and towns.

You can e*X*tend *your* selling season in e*X*actly the same way. No matter what you sell, Air EXpress e*X*pands your freedom of action. It gives you all America or any part of America, overnight. It puts at your command 10,212 daily flights on America's scheduled airlines, 13,500 trucks (many radio controlled), a nationwide private wire system, 42,000 trained personnel. Yet Air EXpress is ine*X*pensive; for instance, a 10 lb. shipment from Chicago to Kansas City costs only $3.14 with Air EXpress — $2.01 *less* than any other complete air shipping method.

E*X*plore all the facts. Call Air EXpress.

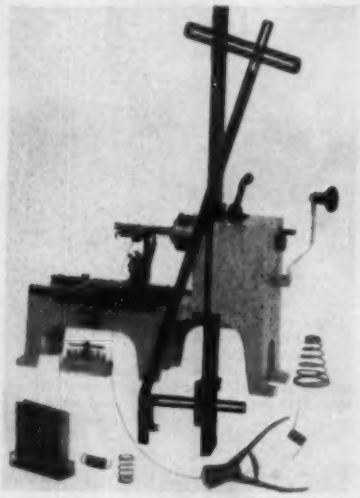
AIR EXPRESS

GETS THERE FIRST via U. S. SCHEDULED AIRLINES

CALL AIR EXPRESS...division of **RAILWAY EXPRESS AGENCY**

liquid is completely safe and stable for use with electronic cleaning equipment. Specific formulations available.

London Chemical Co, Inc, Dept AMN, 1535 North 31st Ave, Melrose Park, Ill



Hand-Operated Spring Coiler Processes 300-400 Springs per hr

Unit is designed to produce accurate compression, extension, and torsion springs from music wire, stainless, Inconel, phosphor bronze, and all other types of spring materials. It is said to be especially useful in small shops or toolrooms for making experimental lots and small production runs up to 1000 pieces.

Model coils 300 to 400 springs per hour using 1/64 to 5/32-in. dia wire, from 3/16 to 2 in. OD, with lengths from ¼ to 10 in. Bulletin available.

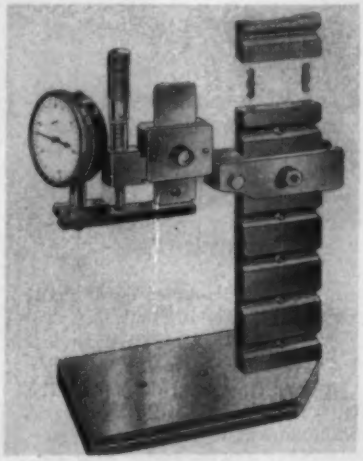
Carlson Co, 3457 Weidner Ave, Oceanside, LI, NY

Electric clutches and brakes in a range of larger sizes have been added to Simplatrol's line. New units consist of five styles in six sizes from 4 to 12-in. dia, with torque outputs from 10 oz-in. to approx 450 ft-lb. Compact power conversion unit can be supplied to transform 110v ac supply to 6, 12, 24, or 90v dc.

Simplatrol Products Corp, 24 Salisbury St, Worcester, Mass

Cleaning bath additive, Alkontrol, replaces commonly-used sodium hydrosulphite in metal cleaning and cyanide copper baths. Material permanently reduces troublesome hexavalent forms of chrome to harmless ones. When used in a copper strike, it improves the deposition on copper casting patterns, improves plating in low-current-density areas, and eliminates some of the causes of blistering. Material is added to cleaning baths at rate of ¼ oz per gallon.

Northwest Chemical Co, 9300 Roselawn Ave, Detroit 4, Mich



HEIGHT GAGE, composed of V-grooved blocks, is a self-mastering unit. The V-grooves, at precise 1-in. intervals, rigidly hold the instrument arm in position. The scriber square may be removed instantly for direct reading with the micrometer—*V-Way Gaging Co, 81 Delawanna Ave, Clifton, NJ*

CENTRIFUGAL PUMP, Gusher Model 9025-M, handles molten metals such as solder, tin, zinc, and lead at temperatures to 700 F. Unit is available with either ¼-hp, 1140-rpm or ¾-hp, 1725-rpm Class B motor, for capacities up to 7 gpm and heads to 8 ft—*Ruthman Machinery Co, Cincinnati 2, Ohio*

Pressure sensitive adhesive designated Flexrock 80 bonds Teflon to Teflon, or Teflon to metal and a variety of other materials. Tests indi-

X

X

X

X

X

The symbol of

AIR EXPRESS

modern lifeline of American business!

← SEE PAGE ON LEFT.

NEW SHOP EQUIPMENT

cate a peel strength of over 1000 grams per in. or a direct pull of 12 to 15 psi for Teflon to Teflon, and Teflon to stainless steel. It can be brushed, dipped or sprayed on. It air dries in several hrs; heating speeds process and can improve adhesive strength.

Flexrock Co, Packing Div, 3600-A Filbert St, Philadelphia 1, Penna

Continuous pilot counterbores are now available for USS capscrews No. 6 up to ⅝ in. They are made of high-speed, tool steel and heat treated for max wear resistance. Concentricity between pilot and cutter body is maintained by grinding entire tool form on centers. As tool wears, cutter body may be re-sharpened; pilot length may be cut off as required.

Fastcut Tool Co, 7405 E Davison, Detroit 12, Mich

Ultrasonic transducers, type M-203B, are lowcost, high-power units designed for industrial cleaning and degreasing operations. They can operate continuously with 400w input power; conversion efficiency is 40%. Over-all dimensions are 4⅜ in. dia x 4⅞ in. long. It weighs 6 lb and has a 6-ft-long waterproof cable. Mounting flange has six holes for attaching unit to tank. Bulletin available.

Massa Laboratories, Inc, Hingham, Mass

Ball bearings with Teflon seals are recommended for high speed operations or where periodic lubrication or servicing is not practical. Seals are designed to provide positive line contact between inner raceway of bearing and the permanently attached full metal shields. Bearings are available in light and medium series. Bulletin 100 available.

Hoover Ball and Bearing Co, Sales Dept, Ann Arbor, Mich

"Be careful you don't smudge it—the tear-stains aren't dry yet!"

Mylar-insulated metal screw, designated Sleev-Scru, has an integral cladding of Mylar polyester film over the shank. Designed to replace screw and insulating tube assemblies, these screws provide electrical insulation between fastener and assembled parts. Screws are made to customer specifications for size and material.

Pylon Co, Inc, Attleboro, Mass

Dust collector, Dustkop Model 520-D, has identical air handling characteristics as standard model 520 but is 10 in. higher and has a dust storage bin that is over twice as large. It is 34 in. high and has 18 x 23-in. base.

Aget Mfg Co, Adrian, Mich

Plastic drafting triangles designated Layout, reportedly are suitable for use where formerly metal triangles were required. They combine precision with light weight, and are available in sizes up to 24 in. Larger sizes available on request.

Dolgorukov Mfg Co, Fisher Bldg, Detroit 2, Mich

Molded nylon spur gears are available in 48-pitch by ⅛-in. face by 14½° pressure angle, and 32-pitch, 3/16-in. face by 14½° pressure angle. Both are furnished with standard stock bore sizes from 3/32 to ⅜ in. Thrust washers of 1/16-in. molded stock are available for stock delivery in sizes from ⅛-in. ID by ⅜-in. OD to 1½-in. ID by 3-in. OD. Metal adaptors for nylon sleeve bearings are furnished in steel, brass, bronze, and aluminum.

Climax Metal Products Co, 863 E 140th St, Cleveland 10, Ohio

Heavy-duty snap-action switch, Duo-Snap, handles up to 2 hp, is furnished in four different terminal and circuit arrangements permitting at least six circuit variations. Electrical rating for the 2-in.-long unit is 2 hp, 230 v ac; 1 hp v ac, and for pilot duty, 20 amps, 250 v ac.

Robertshaw-Fulton Controls Co, Acro Div, 110 E Ottterman St, Columbus, Ohio

Draftsman's pen fills itself at the touch of a button. Cartridge, which contains enough ink for 55,000 in. of ruled lines, can be replaced when exhausted. Price, $5.95.

Clover House, Box 1107, Santa Monica, Calif

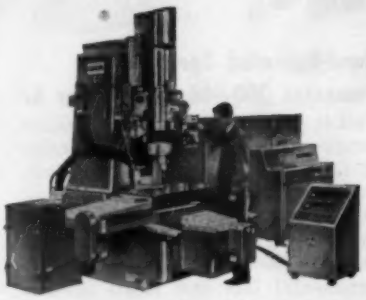
Metallic impregnation sealant, designated 909, contains the additive "I-X" which holds fallout of solids to

(Continued on page 208)

PRATT & WHITNEY NUMERICAL CONTROL APPLICATIONS

ELECTROLIMIT JIG BORER

Equipped with Numerical Control, the P&W No. 2E Jig Borer is equally suitable for toolroom and precision production applications. Settings accurate to .0001" are made automatically from data supplied by a punched tape or an operator's keyboard.



VERTICAL PRECISION HOLE GRINDER

Table and carriage are similar in design to the No. 2E Jig Borer and the same ultra-precision Electrolimit Measuring System is employed. Column, however, is equipped with interchangeable, turbine-driven grinding heads for spindle speeds to 100,000 rpm.

PRECISION ROTARY TABLES

These Pratt & Whitney Rotary Tables are the ultimate in precision and convenience for circular spacing, graduating and angular positioning. Settings accurate to 5 seconds of arc (2 seconds for repetitive settings) are made automatically from data supplied by punched tape or operator's keyboard.

PRATT & WHITNEY

TO "TENTHS" IN SECONDS

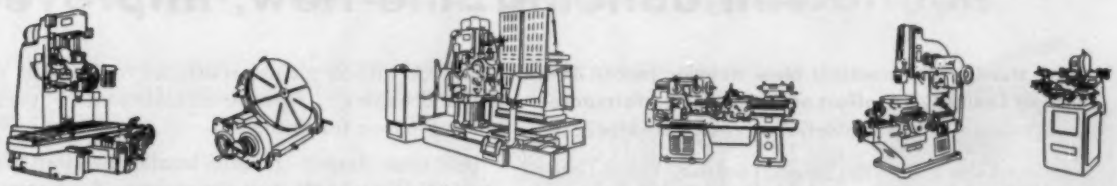
. . . *and no mistakes!*

WITH NEW PRATT & WHITNEY NUMERICAL CONTROL

Operating under Numerical Control, this P&W Precision Hole Grinder is positioned and re-positioned — accurate to .0001" — in an average of only 14 seconds! And since settings are controlled by a punched tape, the chance of work spoilage through operator error in reading blueprint data or setting dials is eliminated. The operator is free to concentrate his attention on work quality.

Applied to Pratt & Whitney Jig Borers, Precision Hole Grinders, Rotary Tables and special machines, Numerical Control not only speeds up toolroom operations, but also makes the high precision of these machines available for efficient short- or long-run production work. In this type work, time savings up to 40% over manual operation are realized. Compare the performance of your present manually-controlled machines with the new standards of speed, accuracy and economy being established by numerically-controlled P&W equipment. If they don't measure up, you are missing important opportunities for improved work quality, larger savings and greater profits.

Write now for complete information.
Pratt & Whitney Company, Incorporated,
11 Charter Oak Boulevard, West Hartford, Conn.



JIG BORERS . . . ROTARY TABLES . . . KELLER MACHINES . . . LATHES . . . VERTICAL SHAPERS . . . CUTTER AND RADIUS GRINDERS

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

(Continued on page 208)

Announcing—the new, improved

New sturdier construction! New heavier jacket! Improved Sealtite* E.F. offers new superior performance in equipment . . . new installation ease. No extra cost!

Sealtite Type E.F.†—the original flexible, liquid-tight conduit, first to meet J. I. C. standards—is now better than ever. New design has made it stronger, tougher, more durable in service . . . easier to install.

Over-all construction is improved. Heavier extruded PVC jacket offers greater resistance to abrasion, cutting and tearing . . . greater oil resistance . . . greater holding power for fittings.

It is more flexible—permits smaller bending diameters. New convenient markings save time, prevent waste. Length is indicated by arrows at 1-foot intervals. Trade size in inches is also shown on cover.

Available in handy cartons, or nonreturnable reels,

STRONGER. Over-all construction is stronger, more durable.

TOUGHER. Thicker PVC jacket resists abrasion, cutting, and tearing.

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GREATER HOLDING POWER FOR FITTINGS — easier attachment.

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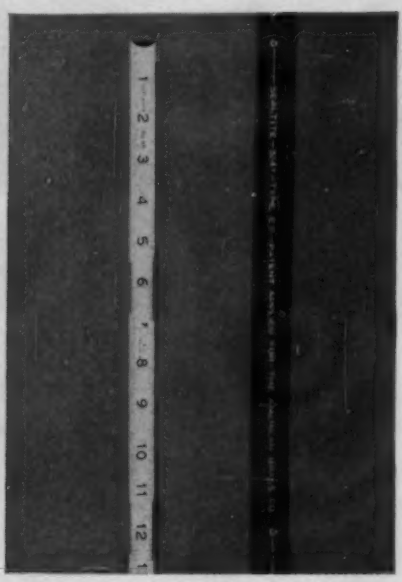

NEW MARKINGS — length and trade size are indicated at 1-foot intervals.

Sealtite E. F. flexible, liquid-tight conduit

at no extra cost. Reels simplify handling and cutting, reduce scrap, simplify storage, have handy charts for a running inventory.

Sealtite types E.F. and U.A. (U.A. is approved by Underwriters' Laboratories) in both black and machine tool light gray. For information, write: The American Brass Company, American Metal Hose Division, Waterbury 20, Conn. *Trademark †Pat. Applied For 57199

Insist on the conduit marked

SEALTITE

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Because Precision Depends on the Measuring System . . . .

SPECIFY PRATT & WHITNEY JIG BORER END MEASURES AND INSIDE MICROMETERS

Jig borers using the "End Measure" system of locating can only be as accurate as the measuring instruments they use. So, to protect your investment in jig boring precision, *insist* on the best in measurement . . . Pratt & Whitney End Measures and Inside Micrometers. Made from selected gage steels, hardened, seasoned and finished in our standard temperature room, they are your assurance of dependable precision that can help you eliminate scrap losses, increase productive efficiency and up-grade product quality and acceptability.

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NEW SHOP EQUIPMENT

approx 5% over a 24-hr period. Material is available in drums from 5 to 53 gal. Bulletin available.

Imprex Division, Dept F-8-57, 2023 S 60th St, Milwaukee 19, Wis

Slide rule called the Decimal Keeper has, in addition to conventional scales, special scales that provide individual positions for each number from 10^{-10} through 1 to 10^{+10}. Problem is worked on special scales, giving answers to between one and two significant figures with decimal point in place. If three figure accuracy is required, problem can then be run on conventional scales. Device is licensed by L J Kamm and marketed as Model 904.

Pickett & Eckel Co, 1109 S Fremont Ave, Alhambra, Calif

Hi-Shear rivets made of titanium combine light weight with high strength for aircraft and missile applications under extreme environmental conditions. They are available in production quantities in a full range of sizes.

Hi-Shear Rivet Tool Co, 2600 W 247 St, Torrance, Calif

EutecRod 158-B, a flux-cored solder-type alloy, designed for joining and sealing steels, copper, and nickel alloys, has application temp range of 400-500 F. Product is available in ⅛, 1/16, and 3/ 64 in. dia.

Eutectic Welding Alloys Corp, 40-40 172nd St, Flushing 58, NY

Tank liners made of ¼-in. polyethylene are designed for steel cyclindrical tanks having a flat bottom and no inside metallic welds. These liners permits standard steel tanks to be used for handling corrosive materials. Tanks can be furnished already lined, or liners can be built to specifications and inserted in tanks.

American Agile Corp, Maple Heights (Cleveland), Ohio

Emulsified cutting oil, called Gulfcut Heavy Duty Soluble Oil, has been developed for heavy hogging cuts, fast fine cuts, boring and grinding of ferrous and nonferrous metals and alloys, including tough titanium alloys. Features include protection against foaming and welding, high-wetting-out properties, excellent surface finish as well as greater protection from rust and corrosion.

Gulf Oil Corp, Gulf Bldg, Pittsburgh, Penna

LET THE KID CLEAN UP

Should skilled mechanics and tool and diemakers be relieved of the chore of cleaning up chips and dirt? Should apprentices be expected to do any part of clean-up jobs?

THE APPRENTICE'S first job should be training in safety and good housekeeping. This includes cleaning machines and sweeping the floor.

Under the old system the apprentice not only did all the cleaning in the toolroom and machine shop, but also had to replace absentees in production. This was not fair to the apprentice. It retarded his progress and training.

With the present shortage of skilled men, together with high wages, it certainly pays dividends to hire a sweeper-cleaner. There should be no one thing except the desire on our part to want to help these young fellows coming into business.

A E Salmons
Norristown, Penna

SURE, LET the kid clean up the mess says I who had to do it when I started in at the Saggy Bottom Engine Company back in Manayunk many years ago. Like all youngsters I wasn't worth a tinker's damn for

"Goodbye and good luck to you on your new job, Sims. There'll never be another machinist around here like you. I'll see to that!"

Because Precision Locating is Only Half the Job . . .

CHOOSE PRATT & WHITNEY JIG BORING TOOLS, REAMERS AND STUB GAGES

While accurate positioning is an essential part of precision jig boring, it's only half the job. Equally important is the ability to transfer the inherent accuracy of the machine to the workpiece . . . and to a great degree, this depends on the cutting tools you choose. Help your jig borer deliver its high-precision potential . . . choose Pratt & Whitney Boring Tools, End Mill Reamers and Stub Gages. Designed and produced by people who know jig borers and jig boring, they have *everything* it takes to put precision to work for you more efficiently and economically.

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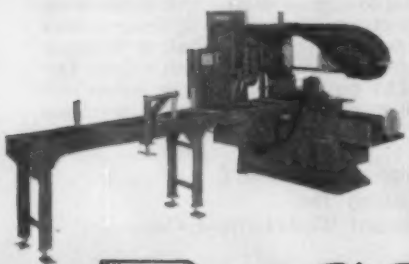
HORIZONTAL METAL CUTTING BAND SAW

Looking for a way to handle heavy duty production metal cutting? Focus your eye on a Wells Model 1200, the quality built, efficient, economical horizontal band saw. Ask your Wells dealer to show you one in operation. You'll appreciate its outstanding value. The Model 1200 has a rectangular capacity of 12" x 16" and rounds, 12¾" O.D. It incorporates such select features as controlled blade pressure to provide proper feed action and increased blade life . . . pushbutton operation and for greater safety, 110 volt control circuits. Also available with J.I.C. controls.

New Model 312 Roto-Veyor . . .



A brand new concept in automatic bar feeds. Designed specifically for use with the Wells Model 1200 Band Saw, the Roto-Veyor converts it into a heavy duty, completely automatic cut-off machine. Feed mechanism and stock clamping action is synchronized with the saw to provide accurate repetitive cutting. Improves saw efficiency, saves time, and reduces production cutting costs. Write today for Bulletin 265.

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WELLS MANUFACTURING CORPORATION
505 Roosevelt Road, Three Rivers, Michigan

the first couple of months and my only way of laying claim to my three dollars a week was to pitch in and wield a broom and clean off the machinery for the master minds of caliper fame.

I suppose some of the modern Elvis Presley's of this jazz age will consider me as being a super-square for admitting my rate of pay, but that's all I was worth and what's more, that's all they would pay a useless kid. They knew what was good for inexperienced kids in those days when a glass of velvety, amber-delight set one up to a fine meal at a well-stocked lunch counter adjacent to the bar of delight.

What is the world coming to when we'll pay a highschool kid triple the wages they paid experienced men when I was a youngster? If they would only attend to business, and do what they could, without griping over the effort they have to put forth, I wouldn't mind it a bit. What they learn in school—if the silly asses would only learn and take advantage of what there is to learn—surely fits them to get a good start in any endeavor. But no, the cynical heel-draggers mope around and stall, when not driven by a Simon Legree-type of foreman, and exert more effort in avoiding work than they possibly could in doing something of value. The kids of this rock-and-roll age kill time so much whenever they can get a chance that it makes the conscientious observer increase his cholesterol content, or else plants the seed for a beautiful ulcer.

I passed a small shop down on the boulevard the other day that was fit for a hog to root around in—it was

"He's not only the biggest idiot and makes the stupidest blunders of any man I've ever had under me—he's got a perfect attendance record!"

badly in need of a good bulldozer—and do you know what! There were three stalling youngsters smoking filter-tipped Llamas and laughing fit to kill. If they had devoted one half-hour of honest effort with a broom each they could have made traveling easier throughout the shop.

So I say it again to whoever is interested in clean shops and sound upbringing of youngsters, let the kid do the cleaning-up to relieve the skilled workers so that they can spend more time on the necessary work. Let the modern advocate of education blow his top because the kid is wasting his time—so he thinks—and let the top soar to high heaven, because when anybody takes the stand that a kid is worth coddling, and should not be compelled to spend any time in keeping things in order, he's losing sight of the valuable element of habitual acquisitions which carry on through his life.

Yeah, let's give the kid a break, and not deprive him of the opportunity of growing up into real manhood. There's honor in the use of a broom, and wiping down a machine, and the medal of recognition will follow in the satisfaction of having done his bit.

C P Arr
Revelstoke, BC

SKILLED MEN should not be habitually employed in cleaning up chips and dirt incidental to their work. On occasion there may be a need for that, but such occasions should be the exception, certainly not the rule. Neither should apprentices be habitually employed on such work as sweeping or cleaning chips, other than those they are responsible for making. Skilled men should be continuously practicing their skill, and unskilled labor should be employed to sweep and clean after them. That is the most economical procedure.

Cleaning down machines is another matter. There is much in that exercise that has an educational value for an apprentice, say in his first year. He becomes familiar with the several parts of a variety of machines and, if he is interested, he will come to know the names of the different parts viz: headstock, tailstock, slideways, carriage, etc, and will be made aware of the vital parts which demand special attention in the matter of cleanliness and oiling. All that is, or should be interesting and instructive to the embryo engineer. If it isn't, he is at the wrong trade. Oldtime foremen used to draw their

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own deductions from the degree of interest shown by first-year lads engaged on cleaning and oiling of machine tools. Their findings weren't always correct, but the method of arriving at them was surprisingly accurate.

Beyond their first year, apprentices should not be employed on such work as a matter of policy. Occasionally it may be necessary to help out, but on such occasions the foreman should use his judgment and choose his method of approach. He should select a lad who shows interest in the smart appearance and good working condition of machines, and he should not make it an order. Rather should he say "You might see to that machine, Bob; I would like a good job made of it." After that job, a really advanced, interesting, skilled job should follow, in appreciation. Even in the case of first-year apprentices, cleaning and sweeping should be interspersed with tasks demanding some little skill. That helps to make the rather indifferent ones keen and makes the keen ones feel really good.

Medium-size and small shops still employ apprentices to clean up, but to a lesser degree than hitherto. There is much to be said for it in the small shop where specialization is at a discount. Apprentices in the small, general production shops are nurtured in the rough-and-tumble tradition. Amenities and scientific aids to production are largely non-existent; improvisation and original thinking are the order of the day. Dodgers don't last long in the small plant; if they cannot "take it" they "get it." The residue is high quality stuff. Self-reliant individualists to a man, brought up in a hard school, they are not machinists, fitters, or turners; they are each the whole man, they are engineers. They are to be seen at their best in shipbuilding yards, whence many of them gravitate.

Mostly, they are to be met with in the maintenance section where the results of their small-shop apprenticeship training stand out, cleaning down and sweeping up, notwithstanding. No difficulty seems to stump them; their universality and complete self reliance are a joy to behold. They take everything in their stride and handle an outsize forehammer or a micrometer with equal competence.

In my apprenticeship days, the great majority of plants were small shops. It was the "done thing" to jolly apprentices around and who will say we suffered in the process? There usually is a sound reason behind most conventions, although some abuse them. Some bosses employed apprentices as a cheap form of labor, but they were a minority. Again, with the passing of time, some conventions become dated. I feel certain that in the smallish, general purpose outfit, the traditional form of training does and will persist. It is an essential part of such shops and it turns out good, all-round craftsmen.

I don't think "Clean up your own mess" is the only decent way, not in all circumstances. I believe it is to some extent suited to the needs of the small shop engaged on variety production and maintenance work. Even there, however, it should obtain only within limits. It is bad management to insist on highly skilled men cleaning up all the mess which occurs in a working day around their station, and I don't agree that an apprentice should sweep floors, unless under exceptional circumstances. Nor do I agree that a highly skilled man should be called on to clear away chips from his machine table, unless he is working a small machine producing light cuttings. He certainly should not be asked to clear cuttings from off the floor.

The usual arrangement, here in Britain, is to have a helper attending say, four or five heavy machines. His assignment is to help in setting up the job, keep the floor around the machine clear of cuttings, and clear the machine table if cuttings pile up. He also lends a hand loosening off hold-down bolts and glands when breaking down the setup and removing the job. He does not sling the job. Each crane is provided with a qualified slinger who is responsible for the safety of the job and the men around. A lathe bed being ma-

(Continued on page 216)

"My secretary is so efficient it irritates me. But I'm afraid to fire her—she might start a business of her own . . ."

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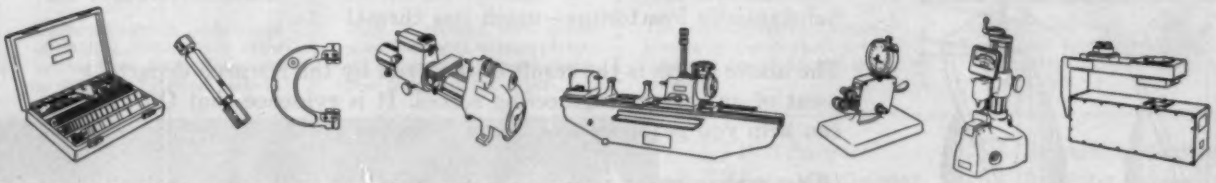

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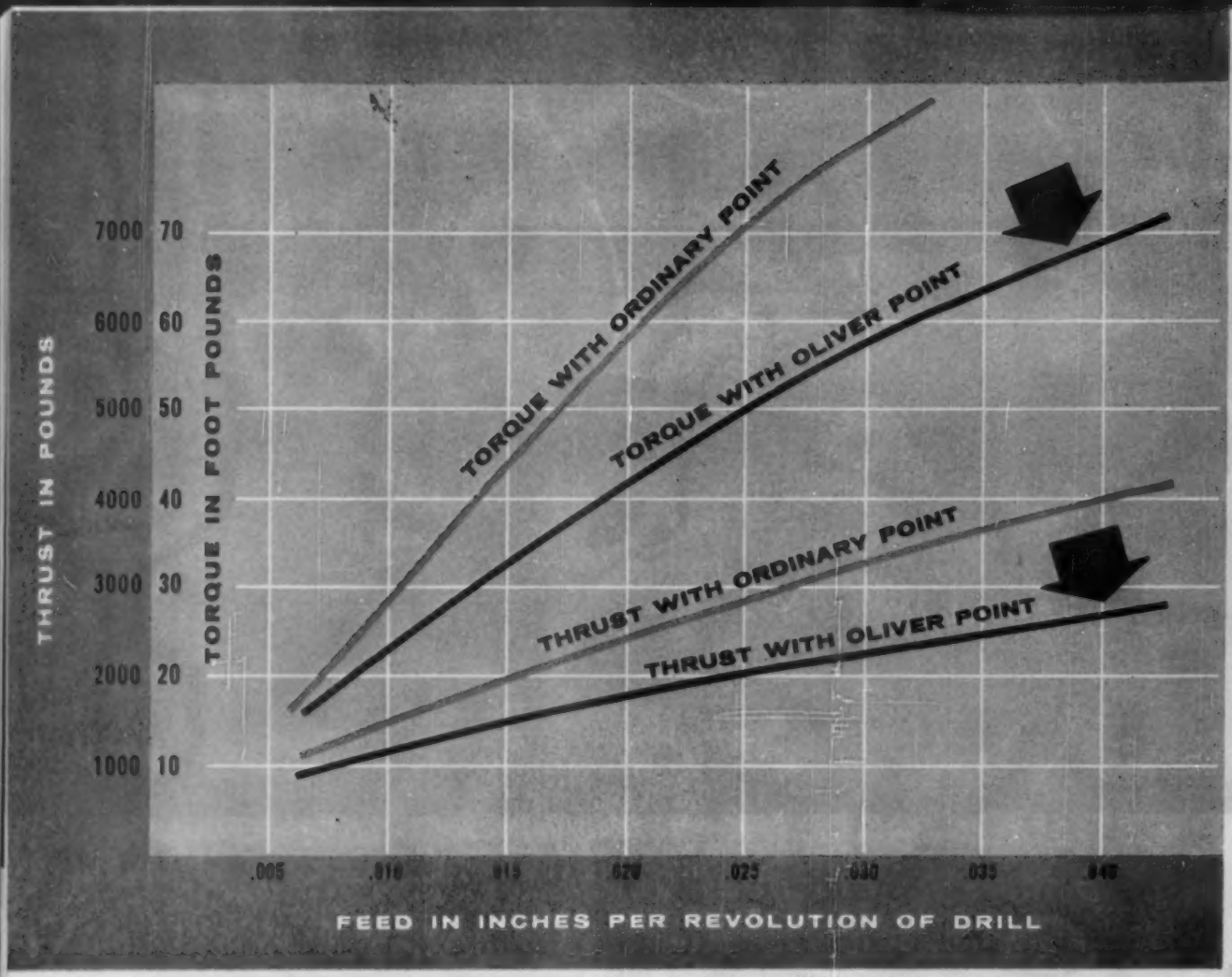
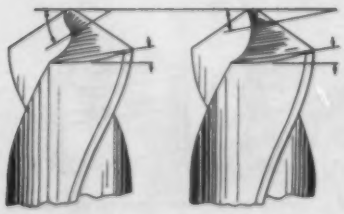


CURVES SHOWING EFFECT OF VARYING FEEDS, TORQUE and THRUST—1" DRILL IN C. R. S.

OLIVER DRILL POINTER

PROOF!

OLIVER helps you get *more holes per grind!*



The drill point on the right is one as ordinarily ground. On the left is an exaggerated view of an Oliver drill point. Note that the clearance angle on the point increases very rapidly as the drill web is approached.

Substantially less torque—much less thrust!

The above graph is the result of tests run by the research department of an eastern engineering school. It is evidence that Oliver can help you get more and better holes per grind.

Oliver's sharpening principle is to grind the drill point so that increased clearance is obtained at the center of the drill. The cut is balanced with each lip doing its equal share and the theoretically perfect point permits easier penetration. A drill sharpened this way has the stamina to deliver more holes before resharpening. Less feeding pressure means savings on drilling machine repairs, power and transmission costs and the drills themselves.

OLIVER

510 DRILL POINTER

Operation is semi automatic . . . covers the entire range of drill sizes from ¼" to 3" diameters . . . grinds two-, three- and four-flute drills and all point angles from 82° to 160° included. The form of the point is controlled by a master cam which may be varied to produce the proper clearance for the material being drilled.

OLIVER

21 DRILL POINTER

. . . a precision machine for small drills and built to machine tool standards. Drills are located in a jig before grinding for positive set-up. A definite setting produces the desired grind each time—accurately and uniformly. The machine may be mounted on a bench or a pedestal.

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DRILL POINT THINNER

. . . designed for conventional point thinning and other work such as deep hole drill thinning, notching, chip breaking, clearing out flute and many other thinning operations. The machine is completely universal, easy to set up and operate. It is a natural companion to the 510 drill pointer.

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Universal—grinds wide range of milling cutters and other cutting tools. Especially suited to grinding tungsten carbide.

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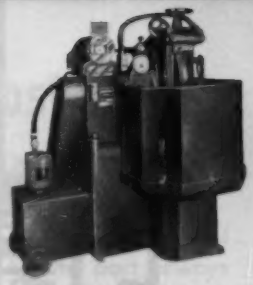

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Guardian to the performance is a U. S. Navy-type shock-resistant lens with wide-angle visibility. You have

a choice of six colors, frosted to prevent false indications.

The same mounting dimensions as standard Westinghouse operators allow interchange with any operator. You can have custom controls at standard prices.

Booklet (B-7022) will tell you more about Oil-Tite pushbuttons and the new *Pushbutton Guide* (B-6749) will give you information on the complete line. Write to Westinghouse, Box 868, Pittsburgh 30, Pa., or call your local Westinghouse distributor. *Trademark J-30256

YOU CAN BE SURE... IF IT'S

Westinghouse

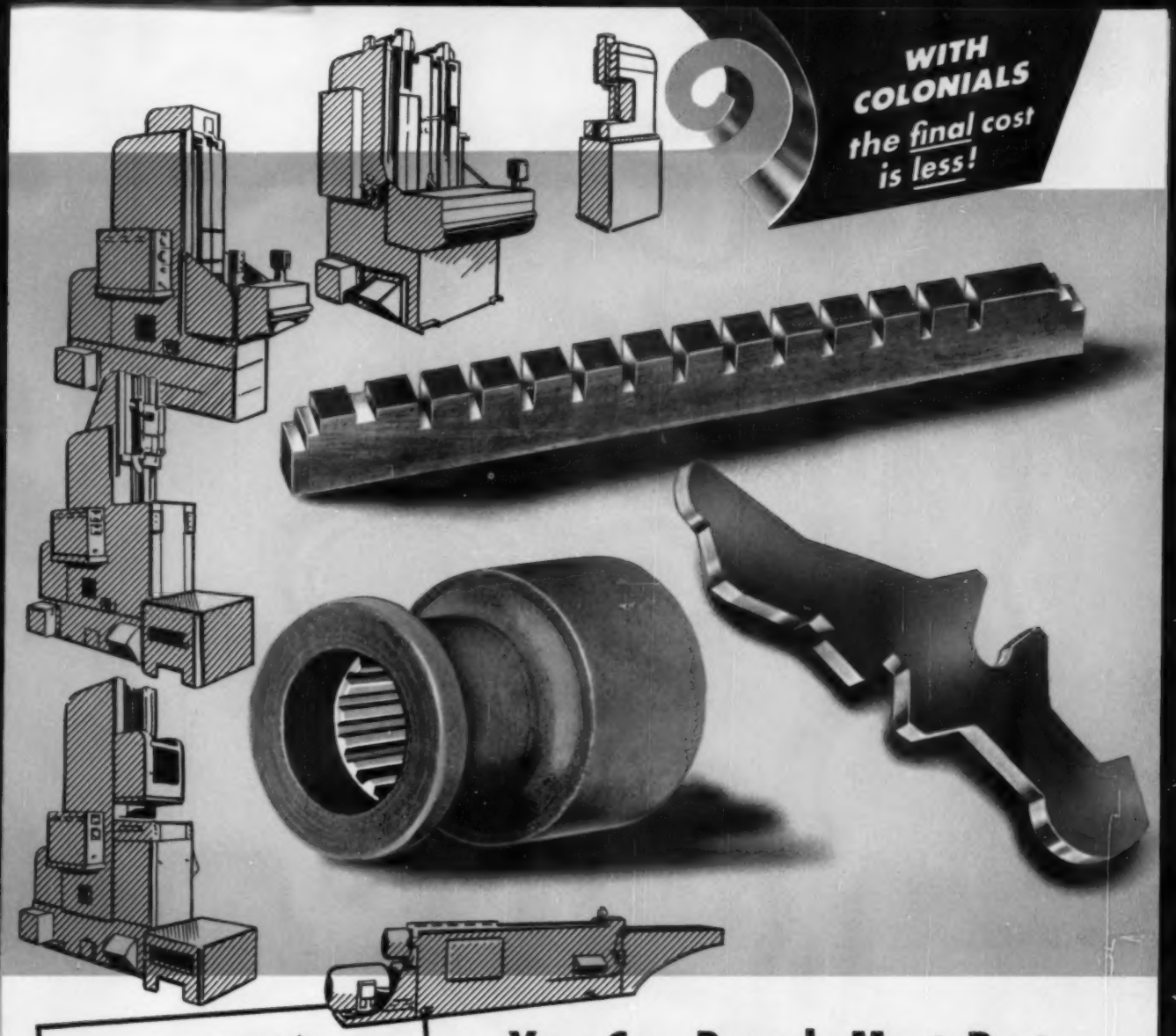
chined at high speed, with carbide tools, will produce a heavy weight of chips in a short time.

On heavy machines, cuttings piled on the table are removed by the helper, usually when the tools are cutting. If the operator wishes to apply a test square or surface gage to the job, he will clear the table, where required, with a hand-brush, and drop the chips on the floor at the end of the machine. He will also see to oiling and keep clean working faces. On medium and light machines the operator keeps his machine clear of cuttings, to the extent of laying them in a heap on the floor at the end of his machine. The floor sweepers do the rest. Few skilled operators or apprentices, after their first year, do any serious floor sweeping.

C Donald
Lanarkshire, Scotland

IN THE good old days when we were happy, tax-free and working ten hours a day, (and damn thankful to have a job in order to earn our bread at two bits an hour) it was the practice of the times to have the apprentice do the sweeping up around the shop. This was known as starting in on the ground floor and I'm not a'woofin when I say ground floor because some of them were just that. We, the upper crust who operate the machines, kept them well cleaned while on the job at hand and particularly at the end of the day when fiddling around was looked upon as a form of time killing. Especially was this practice looked upon as nothing short of decency and cooperation when we workers jumped around from one machine to another throughout the day. We usually stopped work at 15 minutes to quitting time and gave a certain ma-

"Now I know what they mean when they call this a 'car pool'!"



Some of COLONIAL'S Standard Lines:

Ram-Press — Versatile broaching machines at reasonable cost. Four models in 4, 6, and 10-ton capacities with 24 and 36-inch strokes. Ask for Bulletin RP.

Universal Horizontals — Designed to do both internal and surface broaching operations. Models include sizes of 6, 10, and 15 ton with strokes of 54, 60 and 72 inches. Request Bulletin HS.

Utility Press — Low-cost, high-quality machines available in a range of sizes from 4 ton to 10 ton in a variety of strokes. For details write for Bulletin PB.

"Junior" Press — Push or pull assembly and broaching operations. 1, 2 and 4-ton sizes in bench and floor types. Get Bulletin VJ.

You Can Broach Most Parts on Standard COLONIALS

Broaching is the fastest method of accurate metal removal available to industry today. No matter what the part, always ask yourself "can it be broached?" You can use broaching on all kinds of jobs—internal and external, simple and complex, on big or small parts in all kinds of metals in large or small quantities. And to slash your capital investment, use a broaching machine from COLONIAL'S standard line. Send us your part prints. We'll tell you which broaching machine will cut your costs the most on quantities you need. No obligation.

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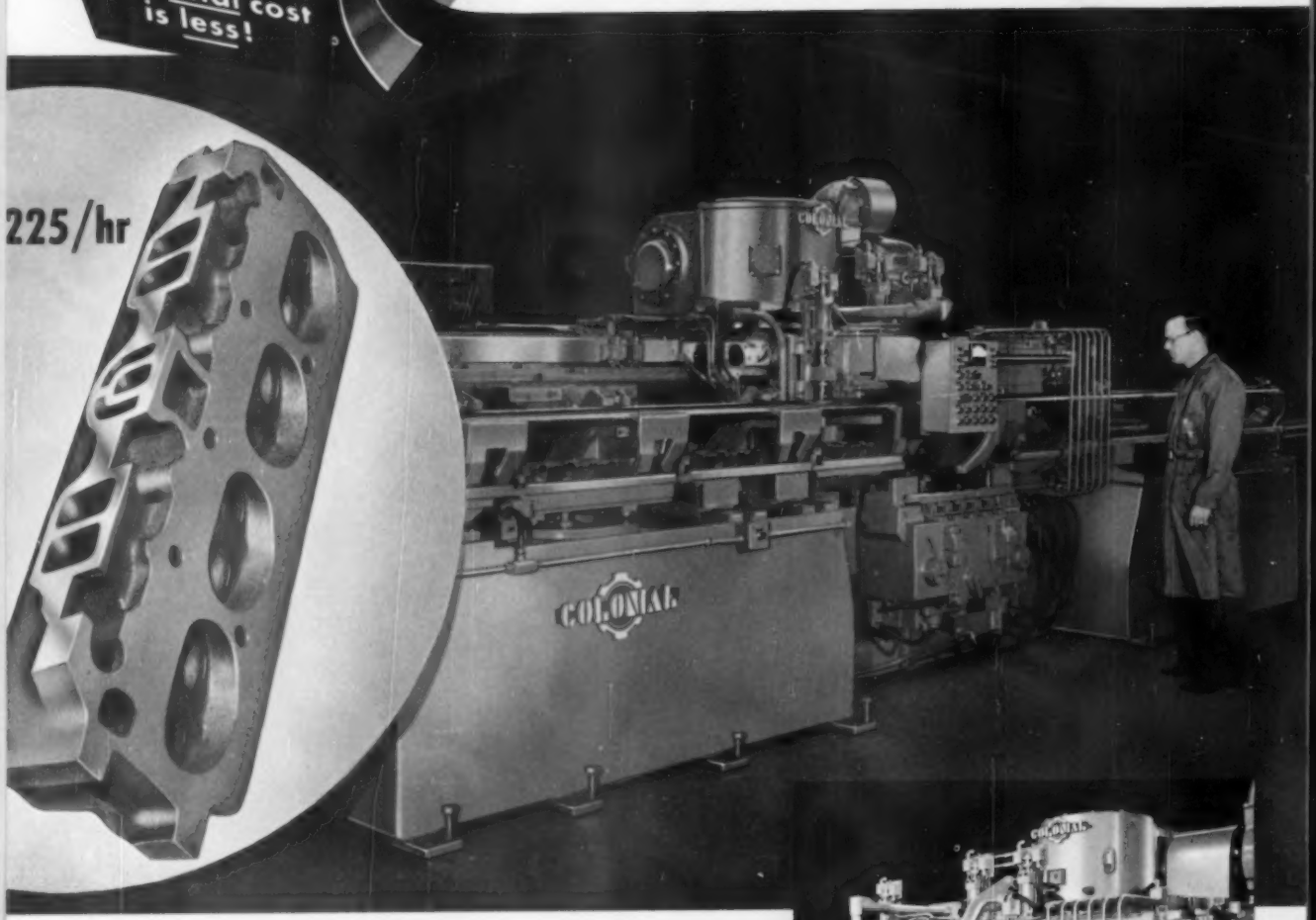
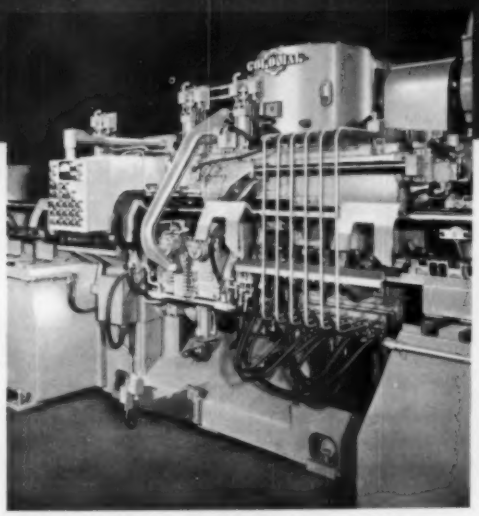
DETROIT 13, MICH.

WITH COLONIALS the final cost is less!



Automated Horizontals for Faster Surface Broaching

Automated broaching is one of **COLONIAL'S** strong points—for with automation you can get even higher production efficiencies from standard broaching equipment. A good example is shown here—an automated version of the popular **COLONIAL** ElectroGear horizontal broaching machine. It broaches 225 cylinder heads per hour at 130 sfpm to ± 0.001 in. tolerance using carbide broaches. Loading, machining, and unloading is completely automatic. Where costs are important, **COLONIAL** surface-broaching methods like this are becoming evermore widely used. Keep up with the latest applications. A letterhead request for BROACHING NEWS makes it easy. We'll send it regularly.



Designed and built entirely by **COLONIAL**, *this ElectroGear, Model 60-90 is a powerful, high-speed machine with a fully automatic broaching cycle. Available in strokes up to 240-inches. Chip removal is automatic. For complete details on these remarkably smooth-running machines, write for Bulletin HM-56.*

COLONIAL
BROACH & MACHINE CO.
DETROIT 13, MICH.

chine, assigned to us by the foreman, a thorough going over and saw to it that it was properly lubricated.

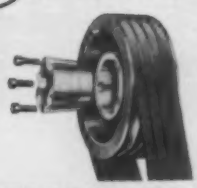
Now that the price of beer has gone up to two bits a can as compared to five cents for one hell of a big glass of real, luscious, creamy, froth-covered dew drops with a free lunch thrown in, and the mechanics receive anywhere from $2.25 to $3.75 or more per hour, we must look at it from another angle. We cannot now consider these aristocrats of the pay check as being profitable when using them as mop-ups.

While the chore of the apprentice in the past years (who really earned his three dollars a week) was to be at the beck and call of any machinist at any time to clean up the machine after its use, we must take note of the fact that these are decidedly different times. Now the work performed by anyone is viewed with scientific appraisal in order to maintain much needed supremacy in this day of throat-cutting competition. To have a man who is earning $3.75 an hour spend his time doing menial work which could be done by anyone earning a dollar an hour is entirely imprudent and economically suicidal.

In light of the rate now being paid learners it is my feeling that cleaning up should not be attempted by an apprentice. Not that I consider it beneath his dignity, but it doesn't strike me as being sensible in view of the fact that his time should be spent on tasks of a constructive nature. This idea of starting in at the bottom of the ladder is fine if it is not carried too far. While one of the chief duties of the apprentice in past years was to wield the broom for a starter, the only thing that I can see that was accomplished was to inculcate the habit of cleanliness.

Expensive machinery should not be subject to the carelessness of some of the lunkheads one sometimes finds in machine shops. It should be pointed out to the person assigned to cleaning up the machinery that great care should be taken when doing so. I am rather skeptical about having any but the experienced man clean up a machine that has been used with a toolpost grinder. An inexperienced man could and probably would be careless about how he would get rid of the emery dust in order to protect the vital parts of the machine. As far as having the sweeper clean up the benches I draw the line. The methodical worker knows where everything is around his section of the bench and to have some little Abner mess things about would

DODGE PRODUCTS you should know



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be enough to make him frustrated.

Let the mechanics attend to their own benches and be mighty careful who you put to cleaning up the machinery after a man is through with it. If you want to institute a system whereby the janitor takes over the job of cleaning up the machinery let him be properly trained in carefully handling it and, if you want to make him feel like an expert on the job and that he is an important member of the shop, just call him a janitorial engineer and he'll work to perfection—and likely as not eagerly seek out the head janitorial engineer for a raise in pay!

J Homewood
Laguna Beach, Calif

TECHNOLOGICAL progress has created new and highly complex skilled crafts, and added so many new skills to old crafts as to alter them greatly. Closer tolerances, finer finishes, more intricate design, and the use of finer equipment and materials have placed a premium on the thorough training of today's apprentices to enable them to become skilled workers. For these reasons, those responsible for apprentice training must discard many of their traditional views and take an entirely new look at the apprentice system.

The old practice of making apprentices clean up machines and benches after older workers had finished with them should be entirely discarded. Where cleaning up the machines is part of an apprentice's regular duties, it would be better to rearrange his duties and time so that he can devote his maximum efforts to acquiring the necessary skills to make him a journeyman machinist or tool and diemaker. Assignment of cleaning up work to a sweeper hired to do nothing but cleaning up machines and benches is plainly indicated. This will not only relieve apprentices of unnecessary duties but will get more working time out of skilled mechanics by letting a non-skilled man do the cleanup.

"Wait'll you see the last hole, Ed, —it's a dilly."

It should be remembered that today's craftsman won't be around forever to provide the skill and practical guidance every shop needs. He can be replaced only by a man who has acquired a broad and thorough education in every phase of shop work—the journeyman machinist or tool and diemaker who has served an apprenticeship in his trade. But for many years, there haven't been enough apprentices to go around. It's true their number is increasing, through the efforts of management and labor. But industry is still far short of filling its apprentice quotas. Today, in the face of an unprecedented industrial expansion, skilled machinists and tool and diemakers are diminishing in number through natural attrition. They must be replaced. The only way a company can assure a continuing supply of skilled tradesmen to fill their shoes is to train its own apprentices. And the only way to assure successful apprentice training is to exclude from the training unnecessary assignments such as cleaning up machines.

As far as skilled mechanics and tool and diemakers are concerned, it is impractical to have the relatively high-priced and highly-skilled operators cleaning the floor around their machines. If added sweepers are needed, it is better to hire them. This will enable the company to get more productivity from the skilled workers who are paid to produce. I say, get more sweepers and keep the skilled men and apprentices working at what is expedient and proper. When the hired sweeper wields his broom, the apprentice can devote his entire time to acquiring needed learning and skills, and the skilled mechanic can utilize his time and efforts properly to the maximum extent.

However, there is one point to remember in this clean-up discussion, and that is this—good common sense should dictate that the sweepers are responsible for getting rid of chips and general waste around the machines, but the individual's work area should be straightened up by the worker himself so that the clean-up men only have small dirt to pick up.

I think that instead of Al telling Wells off about the man insisting on having the apprentice clean up after him that he should commend him

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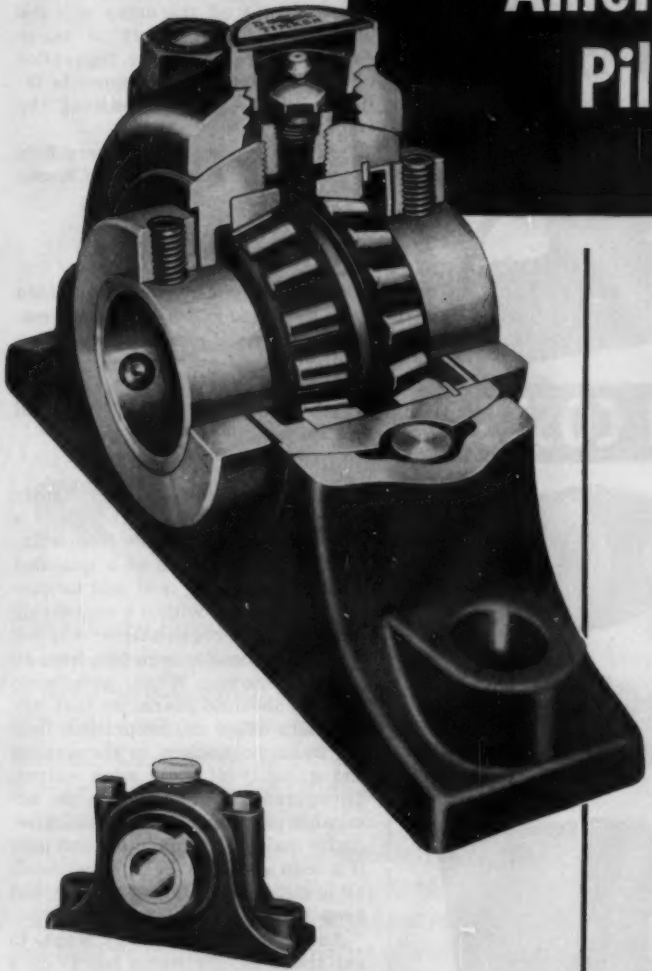

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To meet varying service requirements Dodge-Timken Pillow Blocks are available in five types—the type E..Double Interlock (illustrated)..Type C..Special Duty ...and All-Steel. Available in a range of shaft sizes from 1-3/16" to 10".

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More completely finished parts at the end of the day with no partly finished pieces lying around is the regular accomplishment of Goss & DeLeeuw "1-2-3" chuckers. It means complete finishing on one, two or three ends simultaneously or in sequence without tool resetting, rechucking or parts handling. Machining operations may include boring, facing, turning and threading.

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Investigate the opportunities offered by these machines on your production by sending samples of your work for time and cost estimates—Ask for illustrated descriptive literature.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

highly for calling his attention to the fact that the man has some active brains. Now I wouldn't go so far as to say that Al should have one of the boys clean up his messy desk, because a foreman has certain routines he follows—some are sloppy and some are neat and methodical. If I should judge Al's desk by the way he looks at the value of an experienced man's time I should consider that his holy-of-holies must be in a hell of a mess.

Why not hire a man especially for this cleaning up and have him do roughing-out work when he is not doing that? You could shave a lot of valuable time off the doing of a job by relieving the expert in many ways. This would let the apprentice devote his time to work more in fitting with the idea of learning the trade.

Harry Fort
Port Arthur, Ontario

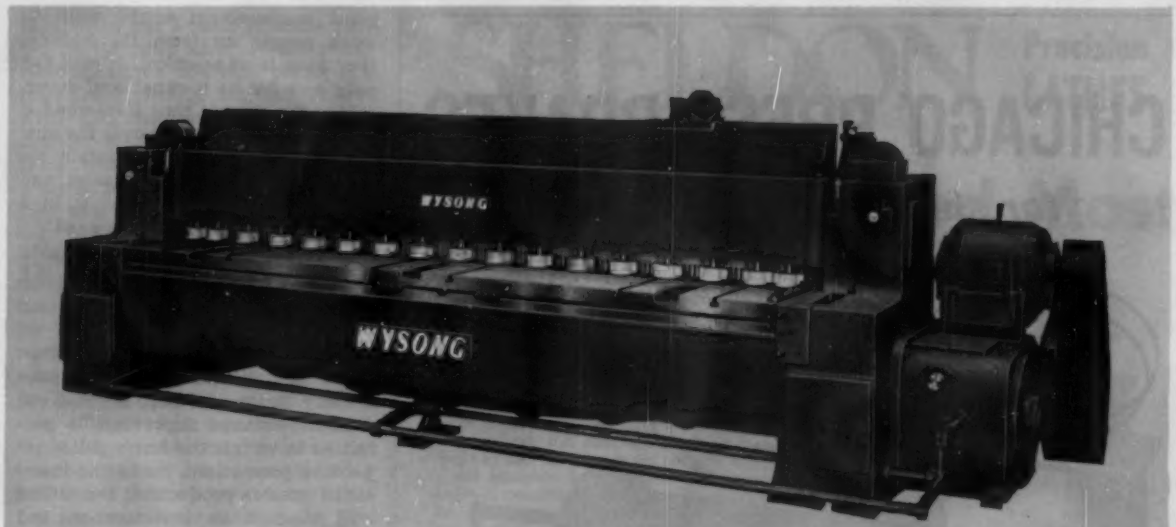
FISHIN'—FOR SKILLS

If there's no one currently qualified in the shop to run a particular machine, is it good management policy to bring in an experienced operator from outside? Or should an inexperienced inside man be upgraded and trained for the job?

WITHOUT fresh blood, life can hardly continue to exist. Even though it is general policy to promote from within, if there is a need of a qualified man on the boring mill and he cannot be procured within a reasonable time from the organization, it is not disadvantageous to seek him from an outside source. When employees have an absolute guarantee that outside help offers no competition they are liable to slacken in the quality and quantity of their work output. To upgrade from within is an admirable procedure, but too much security makes a person overconfident. If a man sees that he is expendable he is most apt to be on his toes and keep his best foot forward.

An employee who really wants to get ahead in this world has to do a little bit more than he is obliged to do. If Hammond wanted to insure his advancement he should have prepared himself for the promotion well in advance. He might have calculated his next move by anticipating future manpower needs or by making inquiries of the foreman or supervisors.

We all have limitations. Not every citizen could become president of the United States. No matter how much



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Simplicity of operation and superior design are keys to low maintenance and low down time.

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plant management might want to work people up from the bottom, they have to be practical. A man can only do what he is capable of doing.

If at the present time Hammond is not in a position to take over the new responsibility, let him maintain his equilibrium until right reason and good skills dictate that he is in a suitable shape to move forward.

Raymon Geraghty
Brooklyn, NY

PRODUCTION over at the Cast Iron Toilet Seat Works is about to take a fancy downward flop, if some underslung-chinned supervisor is permitted to violate the firm's policy regarding promotions. So in the interest of greater production, the writer will conduct an investigation and we may perhaps find out just what makes supervisors get that way.

Supervisors, being just human beings, sometimes suffer with many ailments—ulcers leading the long list. Expansion of the thinking cells (called swelled head) is another very common ailment that is responsible for them having to submit to many adjustments by those who supervise the supervisors. (My, what a complicated thing this is turning out to be. Almost as bad as running a boring mill.) So now let us take a trip over to the factory where Al and Ed hang out.

Here we see a long line of small vertical-type boring mills—their tables spinning around like pinwheels during these times of keen competition and high-speed carbide toolbits. But there is one mill that is not running because the operator had mysteriously disappeared in some way. Perchance he must have been a little guy who had become en-

"Those air mail letters ready for my signature?"

tangled in the T-slots or some casting on the mill table. (What a horrible thought.) The best boring mill men are generally big, tall fellows with long bodies and necks. This enables them to stand clear of the table when they bend over to see what is going on at the bottom of a long hole being bored.

I learn that Al is risking the morale of his department by threatening to hire a skilled boring-mill man from the outside. This was after he had a long talk with Ed who reminded him of the policy of the company and what the results would be. After his talk, Al returns to his own office feeling very much upset. We must pause here to mention that if a boring-mill job is considered a promotion, then we must assume that the job pays more money. Up, you know, is the way everyone wants to go; up. So up pops one of the home guards by the name of Hammond whose lifelong ambition has always been to some day run a damn good fine boring mill. Because he is first in line for a promotion, he loses no time in making his application for the job. But, for some reason at the moment, Al is in no mood to hand this choice plum over to one of his own men.

The Hammond man, however, is one of those tall monsters that I mentioned a while back, and decides that something is fishy. So he leans over close to Al and gives him a very withering look and tells Al that he does not intend to be pushed around.

But Al is a slicker and also an expert at getting out of tight spots, so when he notices Hammond getting mad, he smiles and lowers his voice almost at whisper level as he tells him he will jack his pay up as high as the boring-mill job. But he must keep it quiet and, for the time being, he would like him to go back to his regular work.

Al now sits very much alone in his office. "This is not going to be as easy as I thought," he mutters to himself. The temperature around his feet is dropping off to a very low point. He draws his chair up closer to his desk and there he sits, staring out into space, thinking of the promise he had made to someone that he would find a job for the boring-mill expert. Suddenly he breaks out in one of his victory smiles as he brings his fist down on the desk with a bang. "That's it!" he says aloud. "The night shift! Why didn't I think of that before?"

So that is the way the problem was solved in this case. The expert was given a job running the mill at night and Hammond was promoted

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Sheldon lathes are built in the sizes you need most, for toolroom and production jobs. They are available with swings of 10", 11" and 13"... in varying bed lengths with 18" to 48" center distances . . . and . . . in your choice of pedestal, cabinet or bench mountings.

Powerful, all-V-belt, drive units – either the standard 8-speed (or 16-speed) E-drive; or the production favorite, a rapid, lever-shift U-drive. Where higher spindle speeds are desired, the standard E-drive can be built to provide speeds up to 2,000 r.p.m.

All Sheldon Lathes have handscraped, built-in precision. Each lathe is guaranteed to meet or surpass the American Standards for Toolroom Accuracy. With every Sheldon Lathe goes a copy of the accuracy tests actually performed on that lathe. (19 checks).

Important optional features include: hardened bed ways, L00 Long Taper Key Drive spindles, 4" D1 Camlock spindles, bed turrets, taper attachments and a complete line of toolroom and production accessories.

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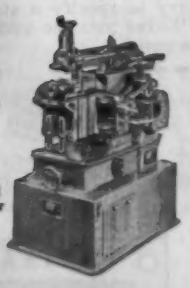

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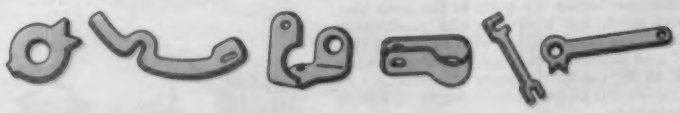
How to SAVE on STAMPINGS

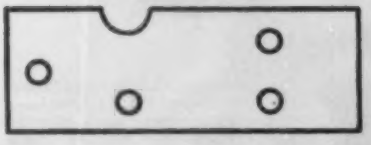


If you buy stampings, it will pay you to read these important suggestions. They will help *us* to help *you*... (1) with faster deliveries... (2) with lower prices.

Your blueprint and the data on it are our bible! We must assume that all tolerances and limitations shown are strictly essential to the functioning of the finished part.

We want to—and we will—give you *exactly* what you require. But if there are unnecessary restrictions or requirements you'll be paying more than you need to. You don't like that. We don't either.

FOR EXAMPLE:



Here's a simple, hypothetical stamping. Tolerances for all the holes and the slot are specified "plus or minus .001"—so we assume such close tolerances are essential to the proper functioning of the piece.

In the light of these close tolerances, your part would cost you $X per M. In effect *you* set the price. We don't. But your parts, when you get them from *this* shop, will meet every one of those specs.

Now, from long experience, we know that in many cases like this some of the requirements *could* be relaxed.

Let's say, for example, that plus or minus .003 is actually adequate for 3 of the 4 holes and the slot. It's comparatively easy to hold to .001 on *one* hole if there's a latitude of plus or minus .003 on the other holes and the slot.

How would these modifications affect what you pay? Your cost would be a *fraction* of $X per M, probably a *small* fraction. That would make *you* happy, *and* us too.

OTHER WORTHWHILE POINTS:

Quantities. Order maximum. Higher quantities mean lower unit cost. Three runs of 2,000 can't cost the same as one run of 6,000.

Short Runs. If you want *short run* stampings, try to set your tolerances accordingly. It isn't practical to hold the same tolerances in Short Runs as in Production Runs.

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When requirements or specs appear more stringent than necessary, we question them with the customer. But this takes time. **Therefore—to help save time and money—we suggest you do not include any specification, tolerance or limitation for which you are not willing to pay.**

For more complete information, send for our free 12-page booklet, "Service in Stampings"

—STAMPINGS DIVISION—

"One Piece or a Million"

3111 Union Street, Glenbrook, Conn.

LAMINATED SHIM COMPANY, INC.

to running the mill on days. Such an arrangement worked out satisfactorily to every one concerned with production going a little higher than before.

The following is a brief explanation of what caused all the rumpus over at the Cast Iron Toilet Seat Works—

Al is a bachelor—one who was disappointed in love. Recently to his delight, he met up with his former girl friend who is now married. She sobbed out a sad story of how unhappy she has been since she married and right now her husband has been out of work for a long time. Al inquired what kind of work her husband did and she replied that although she did not know exactly, she thought that he ran some kind of a mill.

"Do you mean a boring mill?" asked Al.

"Why, yes, but how did you know?"

"Well, I didn't, but I just happen to have a vacancy on one of those things over where I work. So don't you worry anymore. I will arrange to put him on the job," Al assured her.

With that he drew her closer to him and whispered in her ear, "Ah, Millie, I still love you."

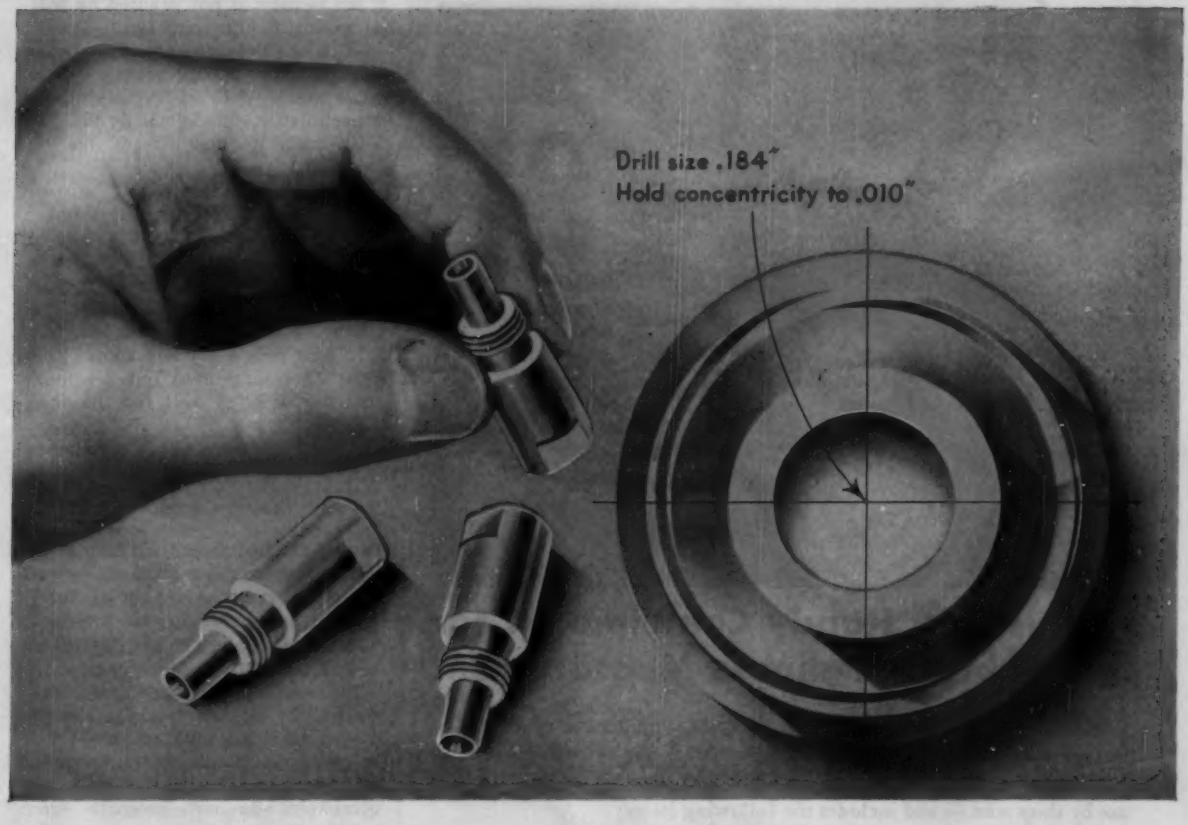
Pencoyd Charlie
Hollywood, Calif

EMPLOYEES like jobs with a ladder. They want jobs that provide some opportunity for advancement. There must be some incentive to get out quality production. When an opening occurs an employee should be trained for the job.

Employees should be upgraded rather than luring in new help. In

"Nonsense, Harris, you don't need a raise! . . . You're too absent-minded to drive a car, too intelligent to want television, and too preoccupied to hear your wife complain. . ."

How Anaconda can help you get the exact Rod to fit the job



THE broad line of Anaconda free-cutting copper and copper-alloy rods gives you widest latitude in selecting from warehouse stock the precise rod for most screw machine jobs. But every once in a while there are special requirements.

One company's problem: The M. J. Grass Screw Machine Products Co., Buffalo, N. Y., machines a part for a gas-burner base from ½" round free-cutting brass rod. Specifications call for a hole 1 1/16" deep by .184" in diameter—with concentricity held to .010".

With standard free-cutting brass rod the drill had a tendency to wander, running the concentricity off as much as .024". To correct this, The American Brass Company provided rod stock with a minor variation in fabrication for deep drilling. This free-cutting brass rod has a slightly harder core, which minimizes the tendency of the drill to run off center at the high drilling speeds used. Now M. J. Grass holds the concentricity to .008" or under. With regular free-cutting brass, rejects ran as high as 15%. With the deep-drilling rod, there are no rejects.

Your requirements: Anaconda Rods are consistently uniform in composition, temper, and free-cutting characteristics. Consequently, they make possible easy duplication of cutting speeds and feeds known to be satisfactory from previous job records.

When you need special physical characteristics, such as a harder core for deep drilling or additional ductility to permit spinning or cold forming after machining, either the temper, the alloy, or both can be adjusted to meet your requirements.

Free technical service: It is the function of the Technical Department of The American Brass Company to assist metal users in the solution of special problems. This service is at your disposal without charge.

Comprehensive data on composition and machinability of standard Anaconda Alloys, standard specifications, weights, and dimensions of standard rods is available in Publication B-3. For this booklet – for special technical assistance – write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. B7B

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MADE BY THE AMERICAN BRASS COMPANY

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PROFILOMETER® GROUP II

An Unusually Handy Combination for Dependable Roughness Measurement

THIS equipment will measure the microinch roughness of every surface that *needs* to be measured, in most plants — with *proven Profilometer accuracy.* It is lightweight and portable — built for use by shop men — and includes the following items:

AMPLIMETER — Shows all roughness measurements from 0 to 1000 microinches, on an easy-to-read meter. Factory-calibrated for dependability.

TYPE LJ TRACER — Measures on OD's as small as 1/8" — ID's as small as 1/4" — flats — tapers — narrow splines. Passes through a 3/4" hole.

MOTOTRACE AND LINKARM — Give the Tracer a *steady support* and *smooth motion,* essential to dependable measurement. No operator skill required.

FREE BULLETIN LT17 gives details. Write for it! ● And, without obligation, let us arrange for a demonstration in your plant. We have representatives in principal industrial centers throughout the Free World.

You can DEPEND on the PROFILOMETER — first in surface roughness measurement since 1936.

Profilometer is a registered trade-mark.

MMC® MICROMETRICAL MANUFACTURING COMPANY

351 S. MAIN ST. ANN ARBOR, MICHIGAN

this case an employee asked for the opportunity to train for this position. If his request is not granted he will be resentful and there will be discord in the department. It is sound policy to keep up the morale of the department. With instructors in the department it should not be too difficult to train men already on the job.

There are other things to be considered in hiring new personnel: character, personality and ability to get along with others. Teamwork in the department and that feeling of pull-togetherness must not be disrupted. It is sometimes necessary to hire new people for key spots. This answers emergencies but we must consider what is best for the long pull.

A E Salmons
Norristown, Penna

THE PRACTICE of promoting from within the company is a good policy and serves to stabilize the labor force. A man can be happy at the most menial task if he can see that there is hope for future advancement.

Promotion and upgrading from within the company might also be called employer upgrading. This is in contradistinction to employee or self-upgrading which occurs when companies do not promote from within the ranks.

When a man leaves one plant and seeks employment elsewhere he follows the common practice of trying to upgrade himself. Exaggeration is the order of the day when seeking employment. This is readily possible because of the varieties of methods that exist for designating the different levels of skill.

When a company practices upgrad-

"That's the trouble around here! Must everything be made to such close tolerances?"

ing and promotion from within they know just what they are getting. The man works for them and they know just what he can do. Hiring a man from outside the plant poses many hazards. The new man may actually turn out to have less skill and ability than he purports. It may result in an unfortunate situation where the new man is actually less capable than the regular employees who have a lower rating.

In such a situation the company must admit to their error and discharge the new man. Keeping him on will result in discontent in the ranks even if his rating is reduced. If the new man does prove satisfactory this practice of short-circuiting the upgrading policy will be resented by the employees and it will be a long time before he is accepted by them. This is an important consideration because cooperation between employees is essential to smooth operation of the shop.

Upgrading is a basically sound and widely accepted practice. When properly conducted, such a plan works well and creates employee satisfaction and goodwill.

In this particular case of the boring-mill operator, the fault lies with the operation of the plan. Why was such a situation allowed to develop? Is the training division there to instruct a man only when the need becomes urgent? It is a far better practice to train the men for upgrading before the positions become available. In this way the company has a backlog of skill to call on when needed.

Al claims it will take a year to properly train Hammond if he is upgraded. Will it also take a year to train a man to replace Hammond? The doctor does not wait until he finds a man with a broken ankle before he learns how to set this particular bone. The company must anticipate growth and changes and train men in anticipation. In this way the transition can be made smoothly and with little shock and disturbance.

Sing Yen
Brooklyn, NY

IN ANY KIND of fishing one has to have bait, the kind of bait that makes fishing worthwhile, and not just an exercise in patience or frustration. By the same token, if you want a capable, enthusiastic working force you must make it evident that every employee in the organization has a chance to advance in skill and earning capacity. Otherwise your particular shop will be just another

HAVE YOU HEARD ABOUT THIS EXTRAORDINARY CLEANER?

It saves money in paint shops!

Oakite Rustripper is an alkaline material that strips paint, pigment residues and phosphate coatings from steel at the same time that it removes rust and oil.

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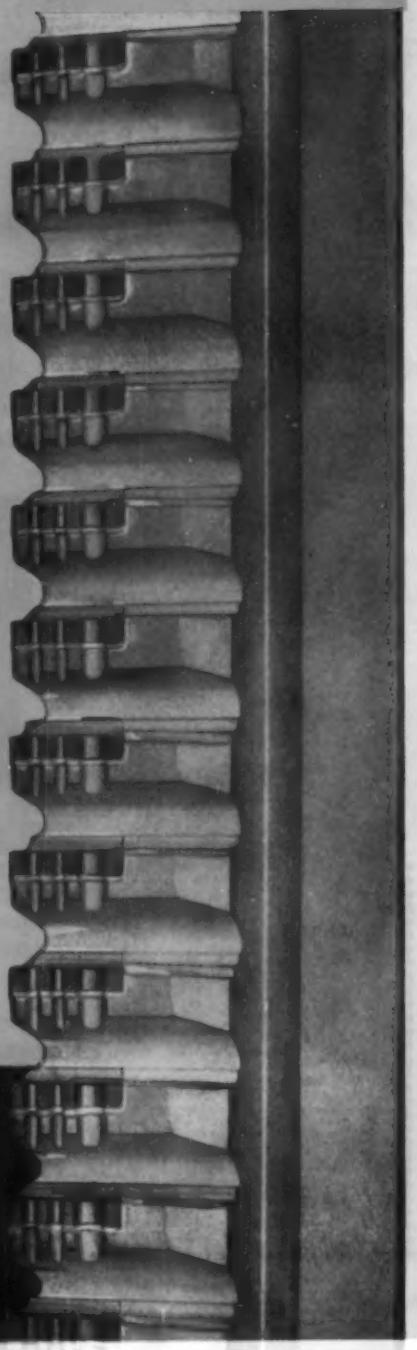
whenever possible!



You can't always use carbide. Your broaching speed may be too slow . . . or your machine may not be sufficiently rigid . . . or perhaps your production requirements are not heavy enough. So we say, *"whenever possible."*

And when you can, Lapointe inserted-tooth Carbide Broaches will give you amazing results on long production runs. It is not uncommon for a customer to tell us of getting *100,000 pieces or more between sharpenings!*

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known to be the best in
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way-station for the ambitious man in search of a better job; no one goes very far on a dead-end street.

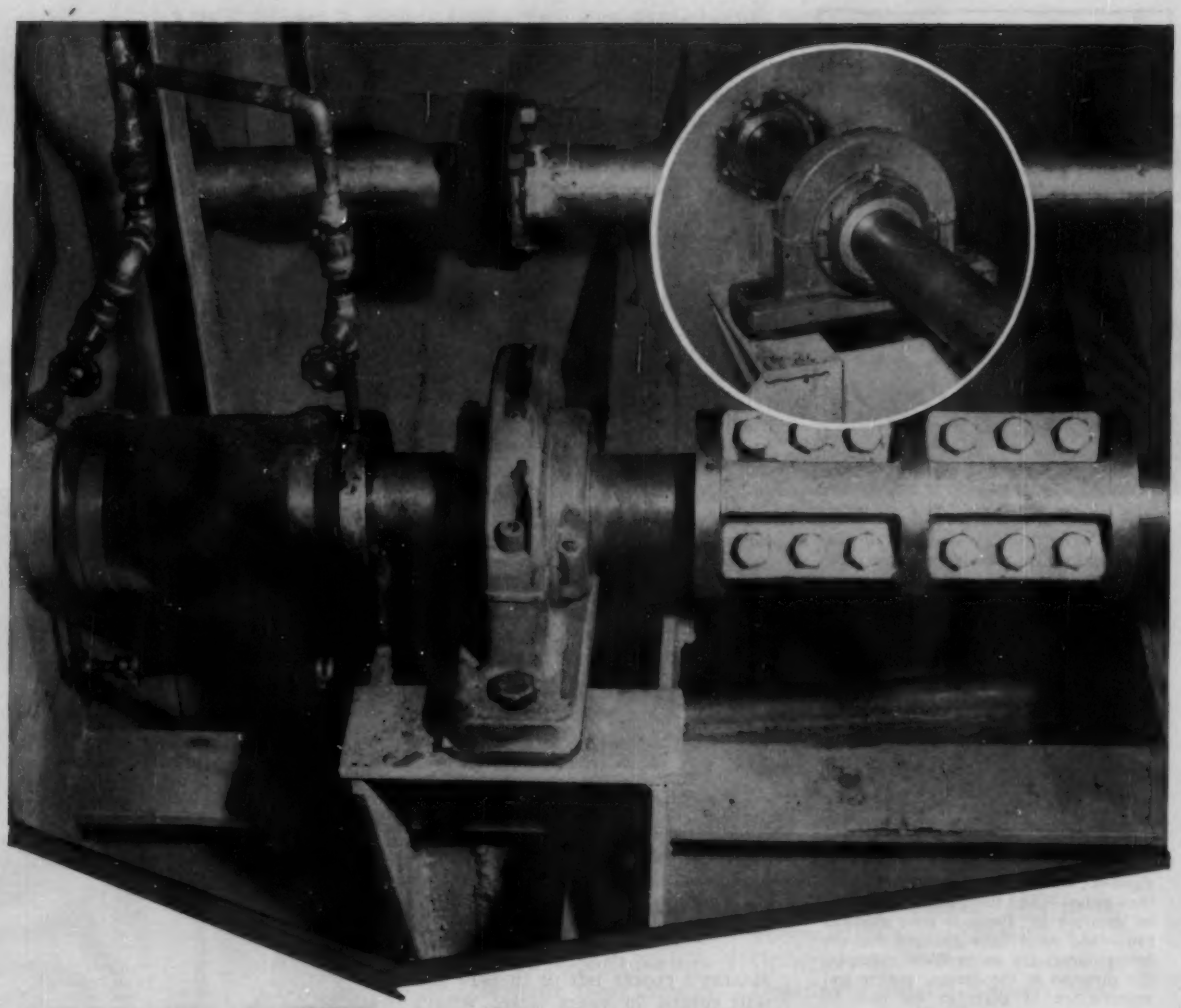
Here we have a case in point of an ambitious worker anxious to take a crack at a better job, but the stymie is lack of experience. How can a man acquire experience if he can't get a chance to work at a job? With a boring mill instructor somewhere in the offing the case gets "curiouser and curiouser." Why should the foreman have to hire outside talent? Admittedly, it would not be practical to put a green man on close tolerance work on any unfamiliar machine. With an instructor available to supervise his movements and guide him over the rough spots an intelligent worker should be turning out acceptable work in considerably less than a year.

To me it looks like Harrison is willing to upgrade the men, but is unwilling to spend the time and money to install a workable training program that will in the fullness of time provide a reservoir of capable workers to step up to the higher skilled jobs that are certain to become available.

So Harrison, if he really believes in upgrading as essential to shop morale, should get his foremen together and work out a plan that will give the men an opportunity to fit themselves for jobs that require a higher level of skill. This will take a certain amount of planning and probably some loss of production time.

Suppose, for instance, you have a milling machine operator who is interested in breaking in as a boring mill hand. It could be arranged that this man act as striker for the regular boring mill operator for one hour on alternate days. On the days that the milling machine man didn't have his hour on the boring mill he

"I had a good job as machinist until I volunteered to take that fool aptitude test!"



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Take this ship, now in ferry service on the North Carolina Coast, as an example. Six pillow blocks were required to support two drive shafts. Since these shafts pass through bulkheads and are surrounded by other equipment, conventional pillow blocks are extremely difficult to install or replace. Engineers from our Dixie Bearings, Inc. Division recommended the *split right down to the shaft* pillow blocks shown above.

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known to be the best in
BROACHING

teered to take that fool aptitude test!"

RUSHING THE GROWLER

Those were the days — down to the corner saloon, at the side entrance, you could bring a pail, bucket, or pitcher, and have it filled with cool draft beer — that was "rushing the growler," a real treat back in 1907. If you preferred you could buy good 7-year old bourbon whiskey by mail order for only $3.20 for *four full quarts*. Or if you lived in a "dry" area, you drank patent medicine — for your "health" — that might contain up to 47% alcohol.

Dreaming of the "good old days" is a popular pastime, but it's not at all entirely realistic. There have been many changes since 1907 that we tend to lose sight of; diversions in 1907 were fewer than today — and there was less time to be diverted in! Products have changed too — and most have changed for the better. Gears are an excellent example; the progress in the design, quality and manufacture of gears in the past 50 years has been remarkable. This progress is continuing today at an ever-increasing tempo, providing an important reason for choosing your custom gear source with care — for choosing a firm with demonstrable ability to keep in the forefront of this progress. A firm, in short, with a record like Cincinnati Gear.

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CINCINNATI 27, OHIO
Fifty Years of "Gears—Good Gears Only"

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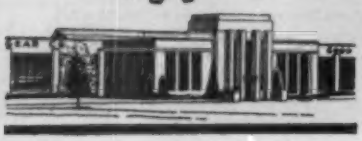

could be breaking in a drillpress operator on his milling machine.

I believe if the company supplemented this practical instruction with the loan of textbooks applicable to the machine under study it would accelerate the training program. Most of the leading machine tool companies put out instruction books dealing with the operation of their product, and in some instances can supply training films at nominal cost. With the textbooks available for home study and his alternate hour of practical work, the ambitious man would soon become proficient enough to step in on a higher skilled job and give a good account of himself.

To my mind there is nothing more productive of good shop morale than for the worker to know that his efforts to acquire more skill in handling the tools of production are encouraged and appreciated by his employers. This type of fishing for skills must inevitably be beneficial to all concerned.

Robert S Alexander
Glastonbury, Conn

PUBLIC PAYROLL

Would the posting of rates of pay on the bulletin board tend to quash demands for raises from those who feel they are underpaid? Or would it stir up increased dissatisfaction?

HALLEY'S COMET left us in 1910 and will return 75 years later. What's this got to do with the matter of wages, some may ask? Just this: that the comet will have gone and returned 70 more times and still the question of raises will not have

"That is the lunchroom overhead, isn't it?"

Speed FORMING and FABRICATING

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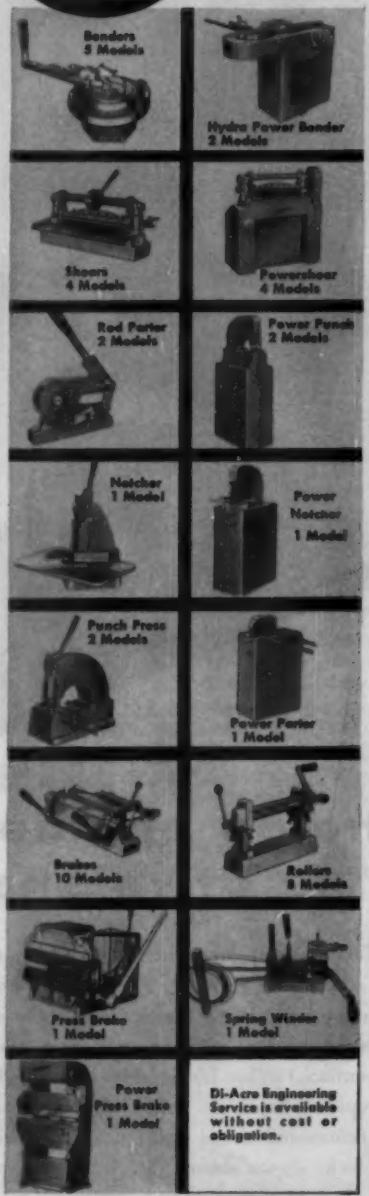

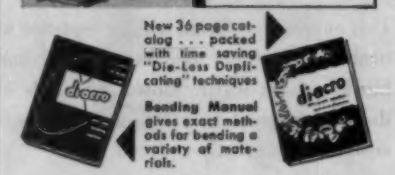

New 36 page catalog . . . packed with time saving "Die-Less Duplicating" techniques

Bending Manual gives exact methods for bending a variety of materials.

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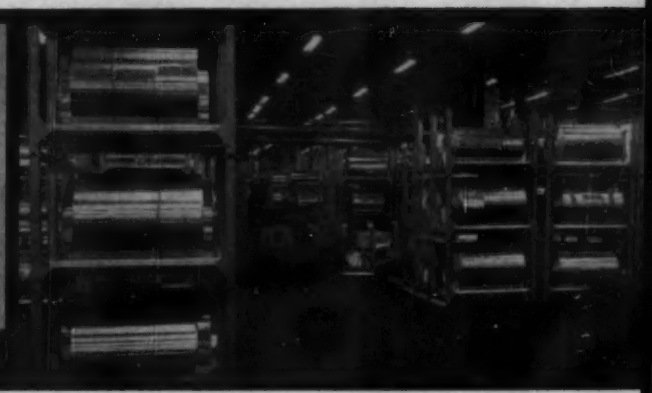
Mr. E. J. Dease, Purchasing Agent of Ekco-Alcoa Containers, Inc., likes the high strength and capacity of Perf-embossed® Scott Wipers, reports they're ideal for such jobs (below) as soaking up lapping compound from die draw rings, wiping grease from the ways of a punch press, cleaning fittings and tubes on a rolling mill.



People buy Scott Wipers for many reasons:

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Scott Wipers have been popular at Ekco-Alcoa—world's largest rigid aluminum foil container plant—since production started. Reasons: Scott Wipers save labor time, do an efficient job, reduce fire hazards. Workers don't have to rummage in bins for usable wipers—don't have to separate, count, or gather up used wipers—don't use wipers too long, or waste them through half use. Soft, absorbent Scott Wipers are uniform and are easily disposed of! Another reason: Scott Wipers cost less than old rags.

Want the facts on how other industries have cut wiping costs? Call your local Scott Distributor. He's in the Yellow Pages, under "Paper Towels." Or write: Scott Paper Company, Department AM-711, Chester, Penna.

SCOTT PAPER

Maker of the famous Scott paper products you use in your home. See "Father Knows Best" and "The Gisele MacKenzie Show" on NBC-TV.

reached a satisfactory settlement. This seems to be a bleak outlook, but so long as man is activated by the desire to service—continually looking out for his own interest—we'll have to face the truth.

Since man worked for wages he's compared his worth with the fellow next to him on the job, not being analytical at all but actuated by the "gimmies" and constantly singing the ever-famous chorus, "How's the chance for a raise?" If Al's scheme were inaugurated it would bring things out in the open where they could be benfited by the healthy light of day, eliminating the impulse to snoop into other people's business and culminating in throwing the switch for the activity of the foreman's perpetual headache.

Even with the publicity of Al's scheme there will still be the persistent pest who will worry the foreman for a raise because he sees that somebody else is getting more. Of course, this does give the foreman a basis for reasoning with the man because he can point out where he is inferior or, to be more tactful, he can call the applicant's attention to the other man's superiority as a workman. At least it gives the foreman a chance to do a little research in his course in deductive logic!

I've had more fun than a barrel of monkeys, as the saying goes, drawing some of my men out on why they thought they had earned a raise and believe me, one can learn a lot about human nature that way. Some will claim that they should have more money because so and so gets more, others will advance the fact that they have to have more for family expenses, and some will bring forward the argument that they were on the job long enough to justify asking for an increase. Never have I had a man justify his asking for a step-up because he has improved as a worker. It's mostly because somebody else gets more than he does.

As things are at present—let us call it the secret method where a man's earning rate is confined to his own mental crypt—the worker getting a high rate of pay would, if he were to keep his business to himself, carry on in a happy frame of mind while the low-paid unfortunate would either be satisfied with his lot or work himself into a dither trying to find out what the other man was getting.

Al's scheme for bringing wages out into the open, will eliminate underhand dealings between the high-paid worker and his foreman. The infinite complications involved in setting just wages makes it rather difficult to establish a just program. A man may be a lulu of a mechanic, yet he is not so productive, whereas another may not be so good skillfully yet is a bear for physical punishment and turns out the work with great speed. One may have been on the job for a good many years and is dependable in his work while another who was hired recently, stands out as being a productive wizard in quality and quantity.

We could go on and on and enumerate many different combinations, but who is there to say which man is the most valuable? To leave it up to the employer to decide what a man is worth would not be satisfactory to the worker because some employers are square-shooters—thank heavens they are in the great majority—but there are some few who would extract the fillings from your teeth if you let them have their own way.

So, inasmuch as the solution cannot be found which can be general in application—other than making each employee a stockholder, and working for himself, we'll have to carry on with the customary loaded dice and contribute a goodly supply of Anacin to the honorable head of the department. Give him a good-size shovel and let him dig himself out of the difficulty the best way he can.

Cepy Arr
Revelstoke, British Columbia

"My foreman doesn't understand me!"

I JUST WONDER if Al's publicity scheme couldn't be used as a leverage to make the man in the upper echelon stay on his toes and intensify

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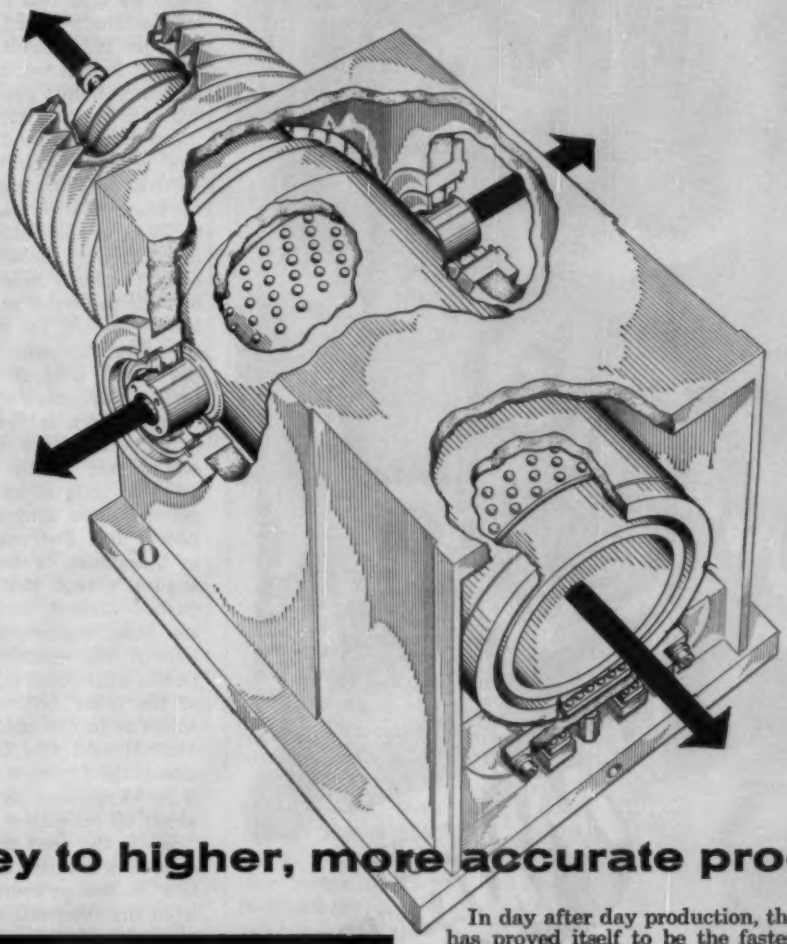

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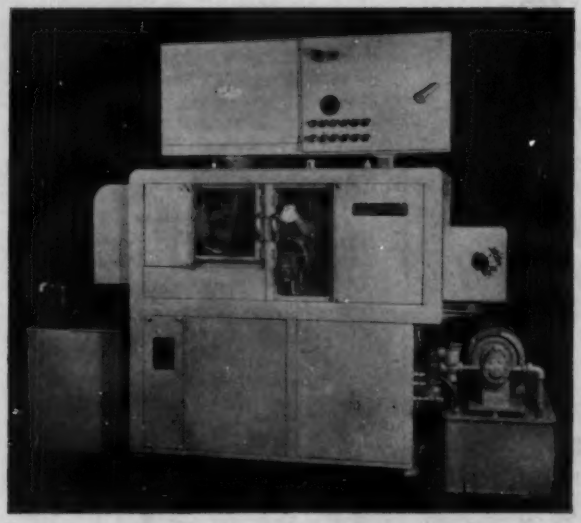
The Key to higher, more accurate production!



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- Wheelslide construction with grinding forces directly opposed on the same plane in which they are applied. Deflection caused by cantilevers is completely eliminated.
- Split-second cycle control by a simple cam unit which may be quickly adjusted when cycle changes are required. The complete unit may also be stored, and interchanged as a pre-set program.
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The Centalign is available in standard models for grinding straight bores, tapered bores or forms such as ball tracks. For high production contour bore grinding, custom-designed vertical Centaligns are available.

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You are invited to consult our engineering staff about your finishing problems.
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Polishing, Buffing, Grinding, Filtering Equipment that automatically cuts your costs.

his efforts to excel, or would the publicity give him a feeling of self-satisfaction wherein he would feel that he is in solid and can drift along? Perchance he would decide that he'd better get the lead out in order to stay on top. I don't think the publicity would do this industrial aristocrat one bit of harm.

What do you suppose the man on the lower floor of wages thinks when he looks at the bulletin wherein his inferiority is broadcast to everybody? If he is honest with himself he will probably soliloquize as follows: "Well, if I'm going to get anywhere in this joint I see where I've got to get hold of myself and put forth a little more effort and study."

Then there is the ten-toed sloth who doesn't give a damn about himself or his family and just plods away so long as he can manage to get his three squares and a can of beer a day. Fortunately he's a happy individual, causes no trouble for anyone except that he has to be pushed around, and doesn't hound his boss continually about more money. The worker who raises particular cain about getting what some of the other fellows are receiving seems to be the squawker of the industrial age; this is the chap who causes the foreman to lose his hair, if he happens to have any, and toss about on his pillow at night.

While the well paid man will go about his business and pay no attention to the newcomer, Mr I-want-what-the-other-fellow-is-getting will worry and fret until he knows what wages the new arrival is receiving and, after he finds out, he'll do one of two things: he'll feel slighted or else he'll worry and stew because

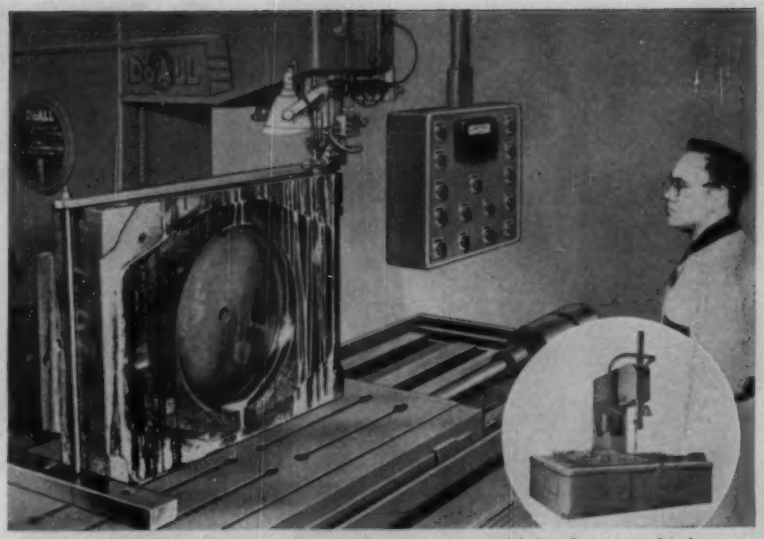
"Let me know if this clatter bothers you!"

the new man is getting as much as he. You just can't win as far as this peculiar bird is concerned; he's lag-screwed and you'll just have to put up with him.

There are times when a man feels that he is underpaid, and there are moments when he comes to the conclusion that he isn't worth his salt. We have all, at times, deprecated our own efforts when we strike that rare day when nothing seems to go right, and feel the firm would be better off if we were to knock off for the day. I've seen men go to their foreman and say: "I'm not worth a hoot today, Jerry; I think I'll knock off for the rest of the day." When a man gets to that state it is the part of wisdom for the boss to agree. The chances are that the man will drop in at Harry's and have a couple before going home to help out with the family washing or else mess around in the yard—anything to get away from his regular work until he arrives at an emotional balance.

I have just come from a visit to a small school on the outskirts of town where the principal is a progressive chap desirous of doing justice to each pupil, and having something concrete at his elbow to convince any complaining parent that his darling was deserving of the grade received on his latest report card. Mr T accompanied me over to a filing cabinet and pulled out a record of one of his pupils — Anthony Littlebast — and here is the list: He was very proud of Tony's academic expectancy which was derived from the formula A E equals 2 M A (mental age) plus C A (chronological age) over three. You see, the comparison between the A E and the boy's I Q gives a pretty good yardstick to measure the little kid's effort. "Yeah!" I replied, my head doing a half-nelson with my neck to such an extent that I missed the final explosion which sounded to me like putting the I Q, M A, C A, effort, reading ability, and possibly the yardstick, in a cardboard box and giving it a hell of a shake before coming up with the final grade. "Does this give satisfaction to the parent as well as the student?" I asked Mr. T. "Definitely," he replied, folding his arms, "beyond a shadow of doubt."

So I, being an old toolmaker who had cogitated, mulled, and puzzled over some sort of a just way of setting rates which would eliminate the many gripes so prone to turn the inside of a foreman's stomach into something resembling the back of an over-aged croaker, said to myself, "Why not concoct something of a similar nature to arrive at a just



New band mill introduces major time savings in machining large work pieces.

Blessed Event for Everyone

Fantastic growth opportunities lie ahead for the American economy —if the development and use of newer, better "tools" can be accelerated. This requires a more widespread understanding that the birth of a better, faster tool is a blessed event of real significance to everyone . . . and that such tools are created only by the savings of the thrifty and the profits of business.

The picture above illustrates the principle. A new machine tool, called a band mill, is being used to reface a die block that forms washing machine parts. This machine tool employs a thin continuous-cutting saw band, made of high speed steel, which rapidly and accurately "slices off" the unwanted metal. The band mill does the die block job in about half the time required by previous machines.

The band mill opens up many opportunities to effect major savings in time, material and labor in the machining of work pieces measuring up to 18" high by 26" wide and weighing up to two tons.

With such a tool a man can turn

Better home laundry equipment at a price people can afford—thanks to better tools like the band mill illustrated.

out more work per hour. Thus, he can produce the greater volume of goods and services required for a growing population and a higher standard of living. And, when enough of such tools are "born" and put to work, better living for more people will be possible. It's as simple as that. Good living, short hours and high wages depend on individual productivity. Only with more and better tools can people increase their productivity.

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E-101N

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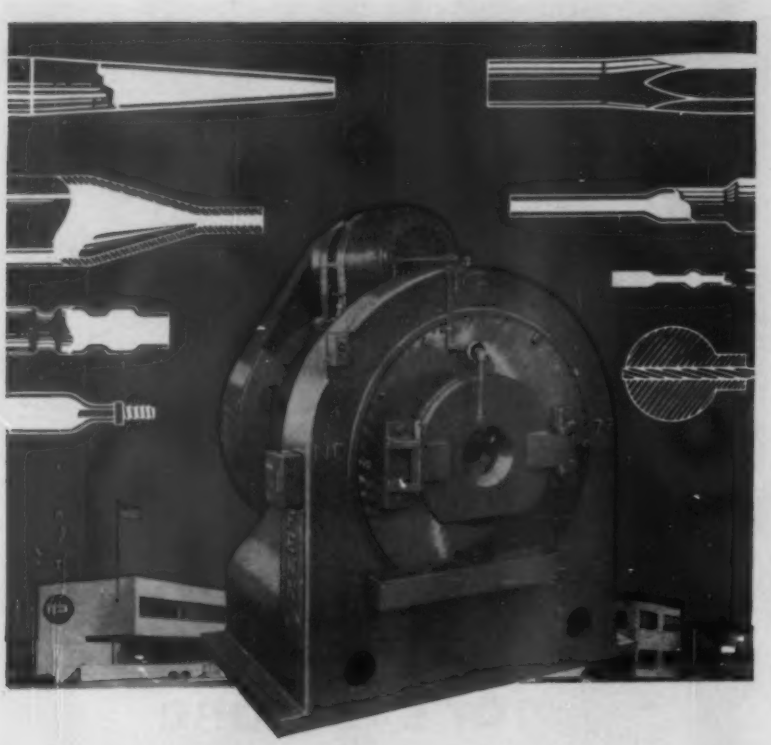

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FENN ROTARY Swaging Machines

THE FENN MANUFACTURING COMPANY • 106 FENN ROAD, NEWINGTON, CONN.

wage?" Get your slide rules out, boys, and figure it out; it's beyond me.

Frank Van Horn
Bakersfield, Calif

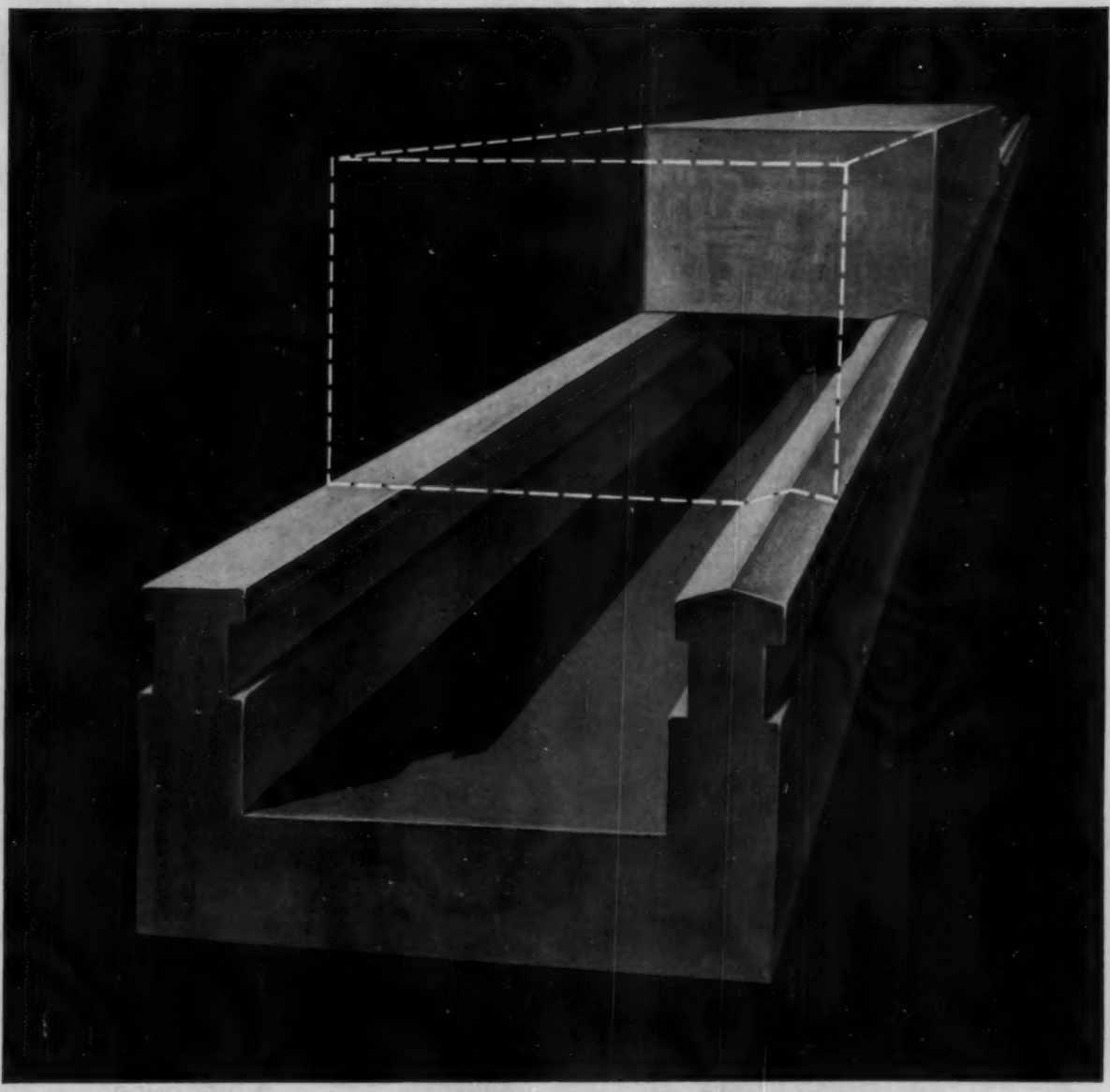
PEACHES AND CREAM

Would a worker appreciate a birthday or "get well" card sent to his home by the company? Or would he be more inclined to look on such a thing as foolishness, and prefer to be remembered in a more practicalway?

I AM NO pessimist and I'm always interested in good relations between employer and employed, but treacly stuff like birthday cards and flowers from the company to employees leave me cold. If we take sincerity for granted, the birthday cards and flowers look good but I fear the sincerity would be suspect in many cases. The idea could blossom in the warmth to be found in some small plants where the employer knows all the men and is personally interested in each of them. The impersonal, sometimes rather cold atmosphere of the large factory owned not by an individual but by a body of shareholders is not conducive to such tender concern for the welfare of the workers.

Different employees would react in different ways to the innovation but I feel the Murphy reaction would predominate. I am a firm believer in regarding employment as a business contract, with each of the contracting parties honorably fulfilling his contract—the employer paying the maximum the job will afford, the employee giving his maximum effort. If those two conditions were loyally observed there would be no need for birthday cards or flowers. A company eager to show solicitude for the more intimate form of employee welfare might consider flowers and "get well" cards in cases of illness. I think that would convey a greater sense of personal interest.

It would, at least, cause someone of standing to interest himself personally in the circumstances of the ranks. The birthday cards and flowers idea is apt to become an impersonal card index affair with some junior clerk in charge, the company being somewhat vaguely identified. That would cut no ice with the men who would soon smell a rat. I believe derision and sarcasm would be poured on the birthday scheme by the Murphys who would argue that the money could be spent to better advantage on higher wages and on



for smooth, steady sliding way action

Febis K lubricants – specially formulated to prevent the irregular, stick-slip motion of slow-speed sliding ways in machine tools – are equally effective in higher speed operations. The special composition of Febis K lubricants gives them the unusual property of providing lower *static* friction than *sliding* friction. As a result, moving parts, starting with a low force, will not jump ahead. Febis K lubricants provide smooth, steady sliding action... assure better precision work. Febis K lubricants also help reduce wear because of their strong adhesion to sliding surfaces. And they have mild EP and rust-preventive properties. Febis K lubricants are available in *two* grades: *Febis K-53* – with the right viscosity for small- and medium-size machines; *Febis K-73* – for heavier machines and more heavily loaded machines. Both Febis K lubricants have passed the Cincinnati Milling Machine Company's stick-slip test and have been checked and approved by the Bijur Lubricating Corp. for use in their automatic lubrication systems. For further information contact your nearest Esso Standard Oil Company Division Office: Boston; Pelham, N. Y.; Elizabeth, N. J.; Bala-Cynwyd, Pa.; Baltimore; Richmond; Charlotte; Columbia, S. C.; Memphis; New Orleans.

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improved facilities, designed to make the earning of higher wages possible and with the minimum of fatigue. I purposely ignore amenities, convinced from experience that they are of secondary importance to the men.

The worker's main concern is the amount of money he can take home at the end of the week. Make it possible for him to substantially increase his earnings and he will raise his sights in the matter of output and overtime. Birthday cards, flowers and luxury amenities cannot compete with a bulging pay envelope and no wise management deludes itself that they can. In this case, Murphy feels he has been overlooked in the matter of money. The birthday card, far from giving him pleasure, rubs salt into the wound inflicted by the company's alleged lack of consideration for his financial needs or aspirations. That, substantially, is my experience of the problem. I pin my faith to providing opportunities for earning good money, leaving the men to their own social ambitions if they have any.

A "get well" card in the case of sickness or flowers for the sick room in the event of serious or prolonged illness, would not lend itself to the same domestic squabbling or vain boasting. I don't agree with Al that the receipt of a birthday card from Personnel indicates to the men that the company thinks more of them than just clock numbers. Birthday card or no birthday card, they would still have a card number and they would still be required to clock in. Al thinks that the cards and flowers are the personal touch that pays off in goodwill, especially if they come from a company that's supposed to be hard-boiled. Many experienced executives will profoundly disagree. My view, formed by experience, is that if the goodwill is not there before the introduction of the billet-doux, that certainly won't put it in the picture.

I don't unreservedly support Murphy's grouse about not getting a raise. There are some who make use of every honest approach to goodwill in industry as an excuse to shout for for more money. I rather think he's in that category. I've no sympathy for them, but I regard the birthday card idea as somewhat childish and feel that Al has good grounds for thinking the men may ridicule it. I cannot feel they will be secretly pleased. My vote goes to Ed; his views are much more realistic, more practical.

C D Mackinnon
Lanarkshire, Scotland

"Nobody's perfect."

I THINK we are all agreed that anything that will foster shop morale is well worth trying, even if it involves getting into the "social swim" to the extent of sending flowers to the wife of an employee on a noteworthy occasion, such as an anniversary or the birth of a child. But I have always contended that good shop morale begins in the shop. If an employee believes that the place where he earns a living ranks with the best in his particular area with regard to working conditions and remuneration, then birthday cards or flowers, like the frosting on the cake, will be appreciated as non-essential, but nice.

Obviously, the reverse is bound to be true. If the man in the shop knows that conditions are not all they might be in regard to rates of pay, chances of promotion, or a grievance such as in the case of the man under discussion, birthday cards and flowers will be looked upon as an irritating form of insincerity.

Whether we are foremen or not, we are all in the business of making money in order to keep the butcher, the baker or, in some cases, the finance company from making things disagreeable for us. So, money, as in Murphy's case, has to be our first consideration, and as a form of recognition it can do a lot for morale. Conversely, the lack of this tangible form of recognition can reduce morale considerably.

Next to money as a morale builder, the employee wants a clean, well lighted, sanitary workplace, and

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New 201LS1 "Plug-in Limit" with roller arm actuator

YOU CAN CHANGE THIS PRECISION LIMIT SWITCH IN SECONDS

This new MICRO SWITCH "Plug-in Limit" switch is designed for highly automatic production-line service. Wiring connections are made to a sealed terminal block which is permanently mounted on the machine. Once wired and mounted, the terminal block need never be removed. All moving parts—both mechanical and electrical—are contained in a separate switch enclosure which is plugged directly into the terminal block. Permanently attached dowel pins assure exact positioning. Since the actuating arm on the switch can be pre-set, the switch may be plugged in with no further adjustment. No re-wiring or re-mounting necessary. This means that you can change switches with no machine down time or other interruption of production.

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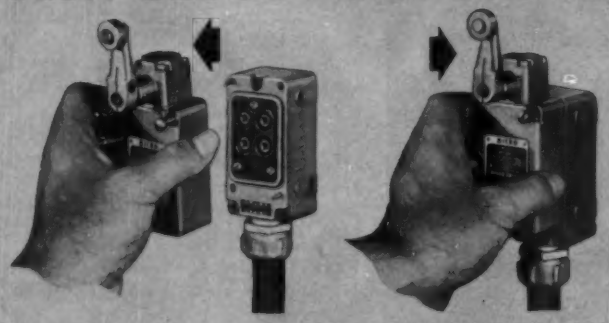
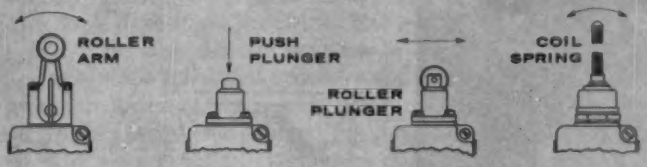
A sealed switch you can replace IN SECONDS! MICRO SWITCH "Plug-in Limit" (2-circuit switch)—cuts costly down time . . . no wiring . . . no mounting

Just PULL OUT and PLUG IN



You can change the new MICRO SWITCH "Plug-in Limit" switch in a matter of seconds—no re-wiring or re-mounting. Just loosen two captive screws, pull out the switch enclosure, plug in the replacement, and tighten the screws.

Actuators available to meet all requirements



Adjustments provide unusual versatility

1. Terminal block enclosure may be mounted on three surfaces and from four directions.

2. Roller-arm actuated switch may be adjusted to operate clockwise, counter-clockwise or both.

3. Operating head of the roller-arm actuated switch can be easily faced in any of four directions.

4. The roller arm is adjustable through 360° and can be positively locked at any position.

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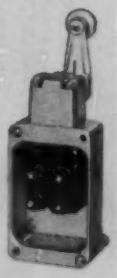
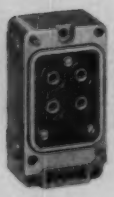
PRECISION SNAP-ACTING BASIC SWITCH



The switch enclosure, contains all moving mechanical and electrical parts, including the plug-in unit. The spring plugs are integrally molded to the precision snap-acting switch body. Sturdy molded barriers protect plugs from damage.

RUGGED TERMINAL BLOCK



Wiring connections are made to a sealed terminal block enclosure which is permanently mounted on the machine. Under normal conditions the terminal block and its enclosure need never be removed from the machine.

ELECTRICAL CHARACTERISTICS

Contact Arrangement	10 Amp.	½ H.P.	1 H.P.	0.8 Amp.	0.4 Amp.	0.1 Amp.	Pilot Duty
2-circuit double-throw	120, 240 or 480 vac	120 vac	240 vac	115 vdc	230 vdc	550 vdc	660 vac max.

Meets NEMA Standards

The MICRO SWITCH completely sealed "Plug-in Limit" meets the requirements of NEMA Industrial Control Standards for non-ventilated enclosures of type IV-1C1-1.12 watertight and type V1-1C1-1.15 submersible.

For complete information on the MICRO SWITCH "Plug-in Limit" send for Bulletin 20 or call MICRO SWITCH Engineering Service at the branch office near you.

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tools that are efficient and help him to produce without leaving him physically and mentally exhausted at the end of the day.

He also wants intelligent and understanding supervision, constructive criticism, and not sarcasm or abuse if he should happen to make a mistake. As a representative of management, the foreman must carry a great deal of the responsibility for the attitude of the employee toward the company, as no amount of paternalism or fringe benefits is going to register with the employee who is having his life made miserable by a foreman of the nagging, bullying type.

By the same token, the life of a foreman in turn will not be peaches and cream if the higher brass subscribe to the theory of "get it out—or else."

I think when all is said and done the root of employee-management goodwill is contained in four simple words, live and let live. If we keep these words in mind and try to carry them out in sincerity, then shop morale will take care of itself.

Robert S Alexander
Glastonbury, Conn

NOT MANY years ago the employee was just another clock number. He could not find expression within the company area. If he complained, the foreman would tell him to get the job out, and cut the chatter.

The foreman's answer indicated poor leadership. In all cases there is a reason for the complaint, and a little tact on the foreman's part would

"Imagine! Somebody told him I was after his job! The stool pigeon."

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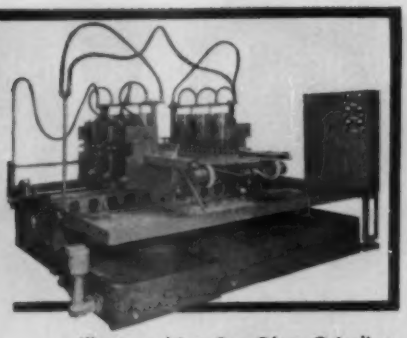

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By *Chuck Life?*

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The patented Buck Ajust-Tru principle makes such unusual performance possible. Write for full details today. *You can't beat chucking with a Buck.*

BUCK TOOL COMPANY

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have determined the cause. Upset feelings between workmen and supervisor affect the morale of the department and the firm. We must always give some thought to the preventive side of the job. We are all paid to get the job done, and it is done through people.

With this in mind we must make the employee feel he is an important part of the organization. How the employee feels about the company depends to a great extent on the behavior of the foreman. We cannot change attitudes by simply providing facts, or a cold blueprint. The employee is more prone to change his attitude if he is allowed to share in discovery of facts. Lectures, birthday cards, booklets and pamphlets do not change peoples' performance on the job. If you want the employee to do a more careful job, do it by discussing the job with him. Encourage him to make suggestions for improvement in quality and service to the community. It is the way to increase morale and efficiency at the same time.

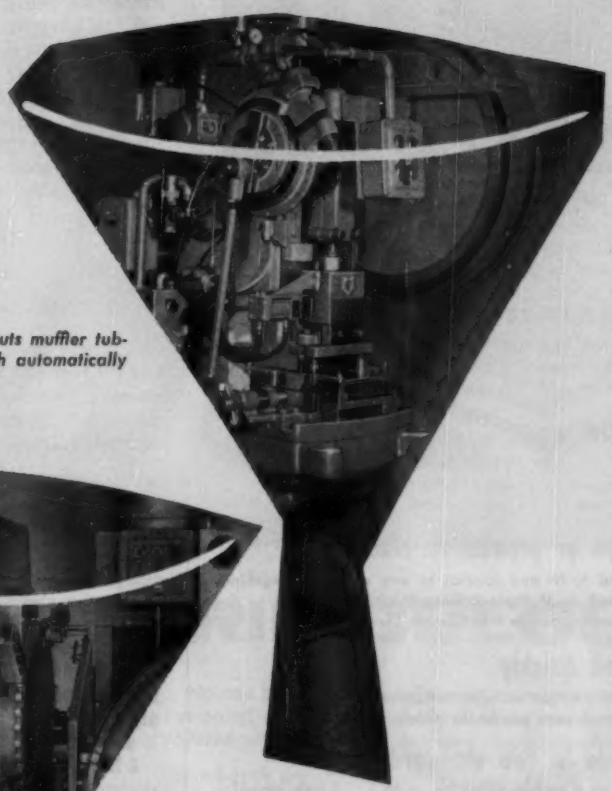
There is nothing wrong about the birthday card idea providing the employee does not become just a clock number the rest of the year.

A E Salmons
Norristown, Penna

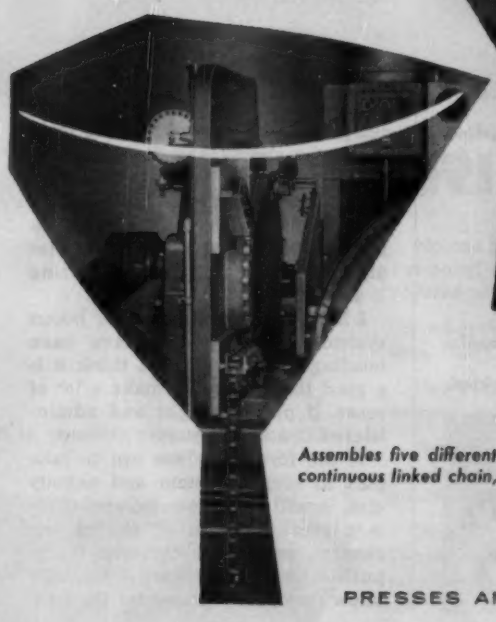
THE IDEAL of human efficiency in industry would be the production of the maximum output of the highest quality in the shortest time with the least expenditure of energy and with maximum satisfaction. It is this last item that is frequently neglected. No corporation however large and powerful, no system however well planned, can neglect this factor and

"Instead of giving you men raises, I'm going to make you partners, what do you suggest we do about the $972,645.27 we owe?"

Stamps out fins in progressive die, then stacks them onto tubes



Feeds and cuts muffler tubing to length automatically



Assembles five different parts into continuous linked chain, spins rivet

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Each of the above units (designed and built by V & O) "funnels" two or more operations into an integrated system of parts production. Eliminated are such intermediate tasks as materials-handling between machines, hand-placing of partly finished pieces in dies, and separate inspections of parts in process.

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They're designed to fit any special or any standard machine in use today—such as Multiple-Drilling Machines, Lathes, Boring Mills, Grinders, Screw Machines or Thread Millers.

GOOD NEWS FOR PRODUCTION MANAGERS!

unit mounted quickly

The design permits either vertical, horizontal or angular mounting—to serve your particular needs.

now available in two standard sizes

Smaller model has a torque capacity up to 1200 inch/pounds; larger model from 800 to 5000 inch/pounds. To control and regulate properly a hydraulic power package is provided.

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hope to keep its employees working efficently.

Few supervisors realize the universality of the need we all have for appreciation of our work. A judicious word of praise is easy to bestow and produces results out of all proportion to its real significance. The value of such a word of praise is nevertheless limited to the effect it has on the worker himself.

A birthday card or an anniversary gift can prove much more effective. Here is a physical manifestation of praise. Here is appreciation in material from that the worker can show to his family and his friends. We all demand recognition of our individuality and this is a good way to accord it.

The plant is large and has a personality of its own in the field of industry. Anything that gives the worker a feeling of participation in, and identification with the big organization raises his self esteem and reflects back on him some of the prestige of the concern itself. A feeling of belonging to the company has cash value. Employees will work for less for a company that treats them like human beings. Cards and gifts provide a good way to create this very desirable atmosphere.

Ernest Jones
Bronx, NY

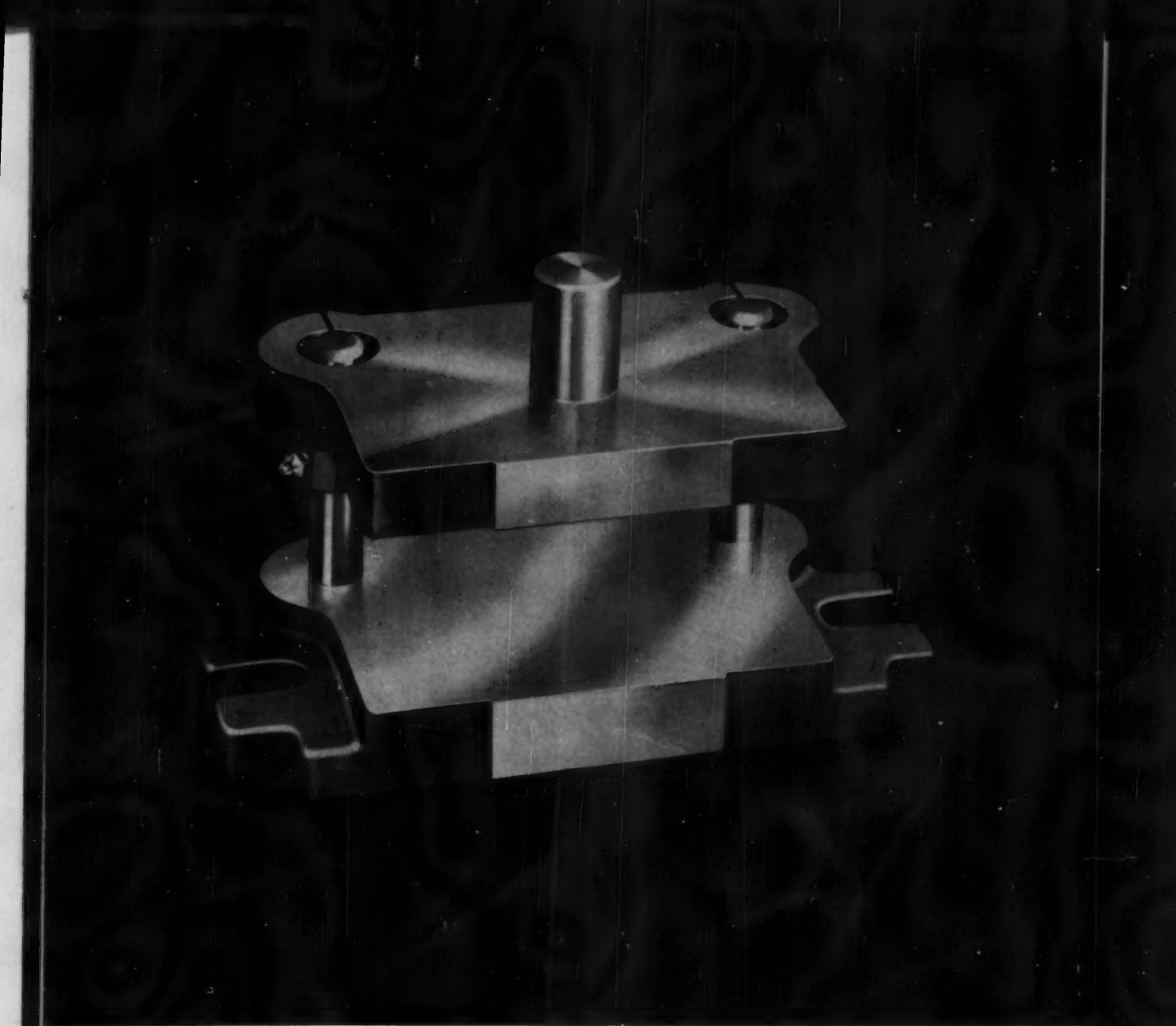
KEY-MAN BONUS PLAN

Can a fair bonus system be worked out for foremen that would spur production, but not at the expense of neglected equipment, or driving the workers?

AL'S SUGGESTION that the new bonus for foremen sounds great should be taken casually. It all depends on what kind of a bonus system is contemplated, and if it is only the foremen who should benefit from it. I think it is out of date. On the other hand, if both foremen and working force are to participate, it is only a matter of agreeing on the principles of the system and then organizing it accordingly.

I have been working under bonus systems myself and I have been heading some of them. I think it is a good thing; they do make a lot of sense if planned right and administered in a fair way.

If the foremen alone are to take part in such a system and nobody else, it will be a clear failure; there is a great shortage of skilled mechanics, and if the foremen try to push their men too hard when they know they make money for the fore-



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And each one of those pieces is just like the others within a few thousandths of an inch. That's precision, the secret behind the success of mass production.

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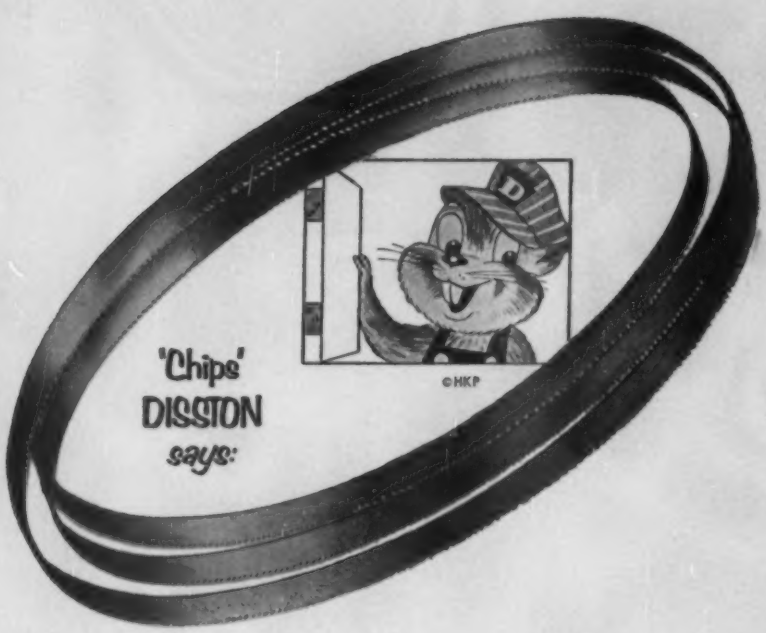

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man only, they will leave, which does not increase production. But if both executives and the guys cooperate to raise the average pay through a higher production, a system of this kind should prove beneficial to all concerned.

There is no reason here why a foreman should forget about keeping the equipment in good shape. I should think the contrary is true. Every leader in industry should know that keeping machines in good condition is the No. 1 requirement to improve quality and quantity. No company will be ruined because steps are taken to introduce a bonus system and at the same time aim at an increased production and keep or raise the quality of the product.

Why should Harrison have a tough time judging his foremen? Does Ed mean that every foreman should have a different bonus system? Any system of this kind must, of course, be based on production. any other kind of foundation for bonus systems will probably prove a failure. A formula for a bonus system based on production results is easily found. Initiative, common sense, ability to handle people, has nothing to do with bonus formulas. Any man promoted to a foreman should have this ability, bonus or no bonus.

I don't believe Al's claim that personality tests are the only means for selecting suitable men for top-notch results. Many years ago another man and I visited the Institute of Technology in Berlin, and there we met a trained specialist on personality tests who tried us out. We both reached high marks, but this is not the remarkable part of the story. What he told us about tests he had made was remarkable. He said he

"I said just listen to that baby purr!"

had recently tested a very well known Swedish man, and that he made a complete failure—was no mechanic. However, this man had been running a private trade school for many years with great success, and was now the head master of a similar school in one of the largest cities of Sweden. Another man was a manufacturer who had built steam locomotives all his life, also with success, yet he was according to these tests no good at all. So I don't believe in them much. I think most of them are unsuitable.

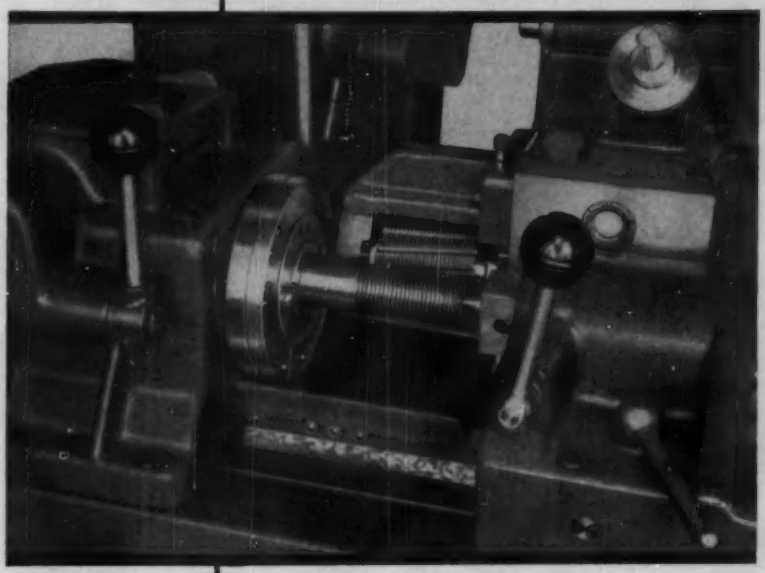
A E Fristedt
Stockholm-Bromma, Sweden

I HAVE heard many arguments pro and con on the subject of a bonus plan for foremen. Opponents agree that you can install a wage-incentive plan for the workers because the piece rate can be backed up by a factual analysis of the operation. But they claim that a foreman's bonus plan is a different story. If the incentive plan pays him according to product turned out, or direct labor efficiency, or the percent his labor is on incentive, the immediate result will be an improvement in the performance of that particular unit and higher foreman's earnings. But his interest in other important responsibilities lags. His mind gets in a single track. He suspects other foremen of building up their performance record at his expense so he pushes bad work on to the next department. Teamwork suffers.

I do not agree with this negative approach to the key-man bonus plan. Just as wage incentives are needed for maximum efficiency of direct labor operations, so is a practical key-man bonus plan necessary to obtain maximum cost-mindedness and efficiency from supervisory personnel. But a foreman's bonus plan to be effective must inspire him to act, drive his activities and reward him equitably. In other words, it must encourage him to manage his broad responsibilities in a manner most profitable to his company; provide him with sufficient detail of a scorekeeping nature so that he can expend his efforts where the greatest need exists; and reward him fairly in comparison with his accomplishments and equitably with relation to fellow foremen.

An incentive system for foremen that will give them ample opportunity to exert their initiative, encourage teamwork between departments, and amply reward good re-

ONE
GOOD TURN



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NO BLOWER OR OTHER POWER NEEDED
. . . just connect to gas supply!

Outstanding service since 1911! Each unit, with the famous "BUZZER" Venturi, delivers the hottest, quickest heat attainable without a blower. Full range control of heat and turn-down. Standards or specials available for manufactured, natural or liquefied gas applications.

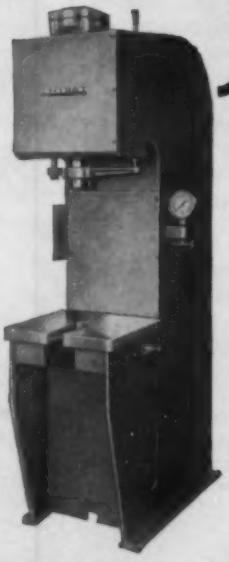
HIGH SPEED FULL MUFFLE FURNACES, Bench Type for heat treating high speed and alloy steels — temperatures to 2400° F.

LARGE FLOOR TYPE OVEN FURNACES for universal heat treating of larger pieces — temperatures to 2000° F.

WRITE FOR NEW "BUZZER" CATALOG

CHARLES A. HONES, INC.
121 S. Grand Avenue, Baldwin, L. I., New York • BAldwin 3-1110

PRICE LIST
ON HANNIFIN STOCK
HYDRAULIC PRESSES



1-TON, Bench Type.....$ 605
2-TON, Bench Type.....$ 680
5-TON, with Base.....$1,530
8-TON, with Base.....$1,605
10-TON, Floor Type.....$2,290
25-TON, Floor Type.....$3,790

Prices complete with motors and starters F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

DELIVERY FROM STOCK

Demand for these popular presses is so consistent we are able to produce them in quantity and pass the savings along to you.

Construction-wise and quality-wise these small general-purpose presses are identical to the larger Hannifin presses, up to 150 tons. Special, optional controls when needed.

WRITE for complete information on the Hannifin Hydraulic Press you're interested in.

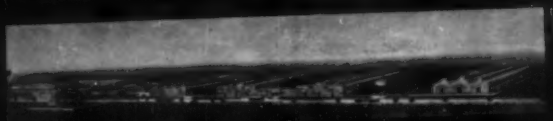
HANNIFIN
HANNIFIN CORPORATION, 517 S. WOLF ROAD, DES PLAINES, ILLINOIS

sults will work out provided it is set up on a fair basis. It should not be based on production alone. It's no more good business to measure a foreman on one or two phases of his responsibility than to hire a manager and say to him, "You just get the production out that shipping door. Don't worry about anything else." A sound bonus plan for foremen should be based on a measurement record that includes the foreman's major responsibilities. He doesn't get lop-sided on production or direct labor because he is also measured on damage and scrap. He gets specific credit for savings accomplished in his department as part of the plan. This encourages a receptive and helpful attitude on new method installations.

A foreman-bonus plan should be based on the principle that the foreman is responsible for all costs as well as production in his department. Personal leadership factors such as initiative and ability to handle workers should also be taken into consideration in working out the bonus plan. The development of this measurement of performance record covering the over-all responsibilities of the foreman is essential in establishing a base for bonus determination. The plan will coordinate into one unit of measurement the performance of each foreman. He is paid a bonus based on the amount his actual performance as a foreman exceeds a predetermined standard base. In addition, a consolidated record which measures the combined performance of all the foremen in the plant entitles each foreman to an additional bonus based on the amount that the actual plant performance exceeds a predetermined standard base for the plant. This will promote foreman cooperation and teamwork because payment on

"Another nice feature, — it's a portable power tool."

INNOCENTI



works in milan (italy)

manufacture of small diameter seamless pipes

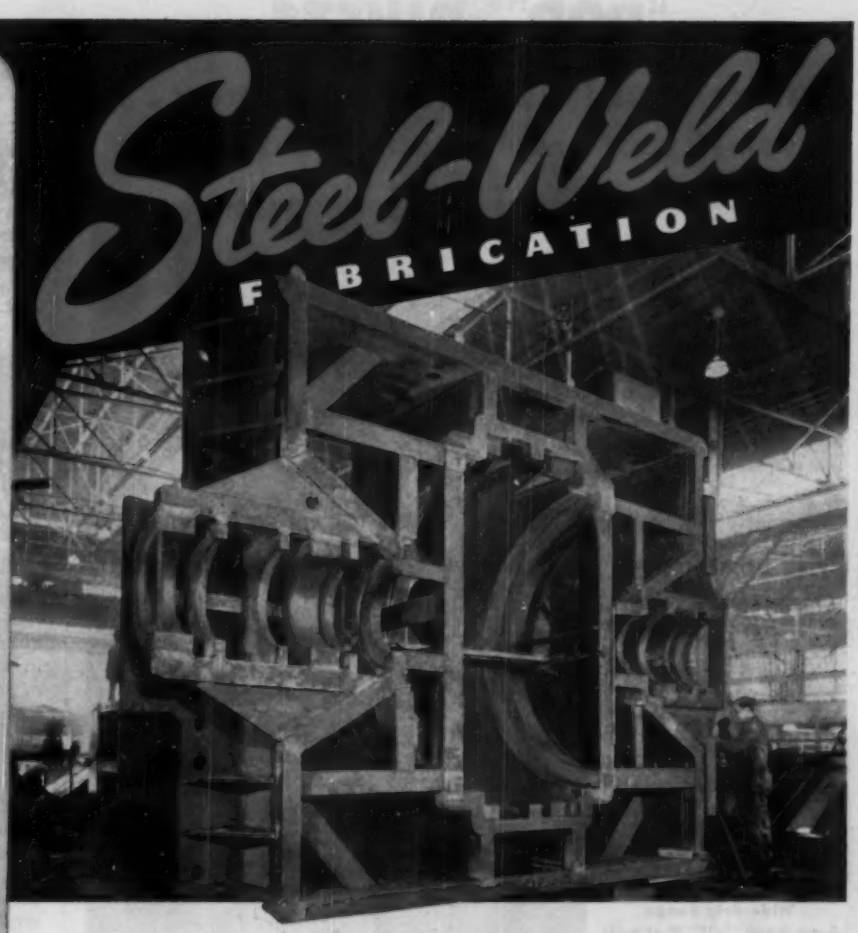
automatic mill for the

INNOCENTI

equipment for steel plants: hot ingot peeling machines

works in milan (italy)

Steel-Weld FABRICATION



Use WELDED STEEL for Greater Strength with Less Weight!

The 100-ton weldment illustrated above is the base unit of a housing for a 300,000 kw Steam Turbine. It is another example of Mahon craftsmanship and Mahon's ability to serve you. This heavy weldment, and those appearing at the left, are typical of the thousands of Steel-Weld Fabricated Parts and Assemblies produced by Mahon each year for manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. If you are not now taking full advantage of the economies offered by welded steel components in your product, you should give the matter serious thought. In the design of almost any type of heavy machinery, or mechanical engineering project, there are parts and sub-assemblies that can be produced more economically, more satisfactorily, and in less time, in welded steel. In weldments you get greater strength with less weight—plus the additional advantages of greater rigidity and 100% predictability. When you consider weldments, you will want to discuss your requirements with Mahon engineers, because, in the Mahon organization you will find a unique source for weldments or welded steel in any form . . . a fully responsible source with complete facilities for design engineering, fabricating, machining and assembling . . . a source where design skill is backed up by craftsmanship which assures you a finer appearing product embodying every advantage of Steel-Weld Fabrication. See Sweet's Product Design File for information, or have a Mahon sales engineer call at your convenience.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York and Chicago

Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON

"POP"® RIVETS

can probably save you money . . .

Even if your present fasteners are free!

Greater Design Flexibility
No need for access to both sides.

High Clinching Action
Exerts as high as 600 pounds squeeze between parts.

Wide Grip Range
Same length "POP" Rivet holds tight through thick or thin.

Vibration Proof
"POP" Rivets cannot back out or become loose. No lock washers or nuts required.

Low Head Profile
Where space is important, "POP" Rivets' minimum head height is the answer.

Less Critical Hole Diameter
Designer wants holes tight, production wants holes larger. "POP" Rivets make both happy.

Least Back-Up Space
Strong, high grip "POP" Rivets need only enough back-up space to provide room for set head.

When buying fasteners, do you figure the *installed costs*? A fastener considered alone may cost very little but be very expensive by the time it's installed and becomes part of a finished product.

"POP" Rivets afford greater flexibility in product design. Often operations can be eliminated, assembly costs reduced, and speed of fastening increased.

Many users find high strength "POP" Rivets the most efficient and economical fastener for their product. Investigate its use in your application. Perhaps you too can enjoy the many advantages "POP" Rivets have to offer. Write us today.

"POP" RIVET DIVISION
UNITED SHOE MACHINERY CORPORATION
West Medway, Mass.

the consolidated record gives all participants an interest in the accomplishment of each other.

A key-man bonus plan properly set up and administered to include all foreman-responsibilities will result in savings in labor, material, and quality control. With such a plan in operation foremen will approach their responsibilities inspired to show accomplishment, their energies directed into the right channels, and with the feeling that they have been fairly rewarded.

Harry Kaufman
Philadelphia, Penna

SCHOOL FOR NOVICES

Would a basic course in facts about the plant, the product made and facilities for making it be of interest and value to the workers in the shop, or are shopmen generally disinterested in such information?

IT IS VERY doubtful whether a course that is given to answer workers' questions about the plant they work in would accomplish any great good or even justify the cost from the management's point of view. The old men know now and the new men find out in a hurry just about everything they are entitled to know or want to know about the company's product and what becomes of it after it leaves the plant. As a matter of fact, management would be surprised sometimes to find out just what the workers do know about their product and themselves.

Drawing on my own experience in railroad shops, I knew, from working on private cars, just when the president of the road was coming through, what brand of whisky and champagne he favored, and the car steward's opinion of his capacity. We learned about the musical comedy girls that were entertained on private cars at get-togethers, and a few

other choice items. We were only machinists, but we found out those things.

From working on rush jobs and special orders, I have learned that some of our products over the years have gone to the czar of Russia's summer homes, to the emperor of Japan's palace, and to homes of celebrities of the day.

In the days when I worked as a machinist I never had any trouble finding out in general what was going on in other shops of the company, or in specifically getting information about an outstanding new machine or development of our product in some other department. As I remember, we had an insatiable curiosity about our bosses—where they came from, where they trained, how much they made, and what made them tick.

From what I see of the lads today, I just doubt whether any of them would spend a cent to learn anything about the product they help make or about the processes in some other department. I believe they figure those things are up to the union stewards, or somebody else—not them. And maybe their attitude is the right attitude. I see courses offered every year in drafting, in a review of mathematics, physics and mechanics, but I see very few takers —even when the company will pay two-thirds of the bill.

The American mechanic, like all his brother Americans, regardless of race, creed, or color has lengthened out his wheelbase, and definitely. Forty years ago, men bought homes. Today, they buy cars. Discriminating men of money go for the Rolls Royce. The Texas plutocrat is happy with Cadillacs, and the high-school boy builds up his own hot-rod.

Whatever we can afford, or whatever we can make a down payment on, that is what all of us today go for After the car—and a long way after, comes wives and children. Bringing up the rear are homes, and I doubt whether the homes would be in existence if it were not for the women.

As always, there are a few determined exceptions, but those boys will get what they want regardless of what stands in their way. The great rank and file are happy in what they are doing, and they are going to keep on being happy in doing nothing. The proposed course won't collect the loafers—it just won't collect anybody unless it is given entirely on company time, and at company cost.

J K Matter
Detroit, Mich

"Nous Sommes Ici!"

When you need it NOW call Wheelock-Lovejoy!
—for Alloy Steel bars, billets, forgings

Some jobs won't wait for red tape. When you want steel *in a hurry*—just pick up the phone and call your nearest Wheelock, Lovejoy warehouse.

Expert W-L metallurgists will help you choose the right stock for the job.

Write our Cambridge office today for your *free* Wheelock, Lovejoy Data Sheets. They'll give you complete technical information on grades, applications, physical properties, tests, heat treating, etc.

Warehouse Service—Cambridge • Cleveland • Chicago Hillside, N. J. • Detroit • Buffalo • Cincinnati • *In Canada*—Sanderson-Newbould, Ltd., Montreal & Toronto.

WHEELOCK, LOVEJOY & COMPANY, INC.
137 Sidney Street, Cambridge 39, Mass.

Here are the

STUPALOX

oxide cutting tools

which have produced

such sensational results!

Production increased... costs greatly reduced... and performance is better

ACTUAL CASE HISTORIES were made on the use of Stupalox oxide cutting tools in a variety of applications. Wherever aluminum oxide cutting tools are properly used, production goes up from 2 to 10 times and machining costs go down from 30% to as much as 75%. Consequently, capital investment in machines and floor space can be reduced.

FASTER SPEEDS, SMOOTHER FINISH, and longer tool life are bonus benefits. That's because Stupalox cutting tools have exceptional wear-resisting properties. They retain their strength at 2000°F and higher. They're resistant to the strongest acids and chemicals normally encountered in machining operations, and nonmagnetic. For complete details, write for Catalog 257.

STUPAKOFF DIVISION OF

The CARBORUNDUM Company

WM[illegible]AM LATROBE, PENNSYLVANIA

NEW FILMS . . .

YOU AND LABOR LAW. *Produced by Employers Labor Relations Information Committee, Inc, 33 E 48 St, New York 17, NY. Slide film, color, sound. Running time 30 min. Part 1, price $20.00; part 2, price $25.00; both parts, $40.00.*

Said to be the only film treatment available on the subject of the history, purpose, and principles underlying our present labor laws, this new production is suitable for use by companies, employee groups, community organizations, and schools.

Part 1 shows the evolution of labor law, philosophy and precepts, and cites the initial use by the judiciary of property and criminal laws for deciding labor cases in the early 1800's when there was no special labor law. It then traces the history of labor laws through WW I Labor Board, NRA, Norris-LaGuardia Act, Wagner Act and finally, the Taft-Hartley Law. Also depicted is the growth of labor unions.

Part 2 shows our present labor law in action, reviews its basic objectives and principles, and summarizes more than a decade of its interpretation. The effects of the Taft-Hartley Law on employees, unions, employers, and the public is explained, and its various provisions are outlined. Recognizing that no law is perfect, and that interpretation of the law by the courts makes a big difference in how it works, the film is designed to stimulate discussion.

●

COLORS AND TEXTURES IN ALUMINUM —*Produced by Aluminum Co of America. 16 mm, sound, color. Running time 18 min. Available from Motion Picture Section, Aluminum Co of America, 1501 Alcoa Bldg, Pittsburgh 19, Pa. No charge.*

An imaginative display of the color and texture possibilities for design in aluminum, this film is aimed particularly at designers, architects, and engineers. It is non-technical, but one part of it is devoted to a simple explanation of how the anodizing process works and how the various finishes are created.

Names in the News . . .

Robert K Lohman has been appointed sales manager of the Cargotainer Division of Tri-State Engineering Co, Washington, Penna. He was formerly manager of materials handling sales of Pittsburgh Steel Products Division of Pittsburgh Steel Co.

John W Buskie has been elected a vice president of Tennessee Products & Chemical Corp, Nashville division of the Chemical, Paint and Metallurgical Dept of Merritt-Chapman & Scott Corp. Mr Buskie has been assistant vice president since April.

Robert A Hall has been elected a vice president of PacAero Engineering Corp, Santa Monica, Calif, subsidiary of Pacific Airmotive Corp. He was formerly a division manager at PAC's main plant in Burbank.

Andrew McCulloch, general foreman of Temco Aircraft Corp's Garland, Texas, facility, has been appointed superintendent of production of three major aircraft contracts being fulfilled there.

Walter E Stewart has joined the American Welding & Manufacturing Co, Warren and Niles, Ohio, as manager of production engineering. He was formerly general superintendent of Minneapolis-Moline Co.

Horace W Thue will direct manufacturing planning for International Business Machines Corp. He was formerly with Douglas Aircraft.

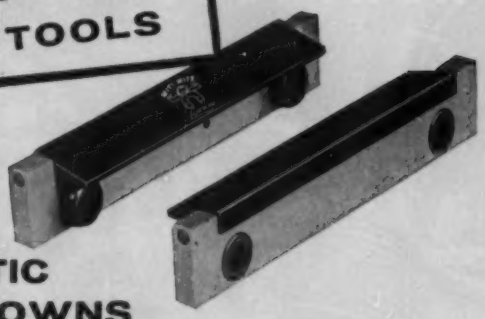
Thomas R Wiltse has been named manager of the Defiance, Ohio, plant of General Motors Corp's Central Foundry Division. He was formerly manufacturing superintendent of the Saginaw, Mich, plant.

James J Walsh, formerly district manager for the Cutting Tool Division of Motch & Merryweather Machinery Co in Detroit, has been named general manager of Tool Supply Co, Cleveland.

George P Leckler has been appointed manager of the Chicago Branch office and warehouse of the Fairbanks Co, manufacturer of valves, casters, and hand trucks.

Earl Thorsby has been promoted to the post of senior master mechanic at Dodge Division of Chrysler Corp. He was formerly master mechanic in charge of pressed steel and body-in-white operations.

NEW LUFKIN TOOLS



MAGNETIC HOLD DOWNS

A new, time-saving idea in hold downs — faster, easier and more convenient. Attaches instantly and holds to vise jaws in any position without use of shims, blocks or parallels.

Clamping edge is 3/32", will hold very thin work. Backs are tapered, forcing the work downward as the vise jaws close. A flat spring tab keeps the hold down in a horizontal position until pressure is applied.

MAGNETIC BASE HEAVY DUTY Surface Gage

A large, rugged surface gage and indicator holder. Increased base size prevents rocking . . . larger, stronger magnets permit use with lug back and other heavy indicators and attachments.

The two heavy duty magnets recessed into the solid aluminum base are completely isolated from the spindle and other parts to avoid transmission of the magnetic pull. Polarity of the magnets is controlled by a king size on-off switch that turns the magnetic pull to full on . . . full off . . . or to any intermediate point to make minor adjustments in position. Ground and lapped, contact face has a V-groove, adapting it for use on cylindrical surfaces.

New design scriber has a removable, long-wearing carbide tip which can be reversed to protect the tip from damage when not in use.

Rugged, rocker arm and large diameter fine adjustment screw permit final, precise adjustments. 9" and 12" spindles, swivel indicator attachment, indicator holding rod, and scriber with reversible carbide tip are included. 18" spindle also available.

MITI-MITE MAGNETIC BASE TOOLS CATALOG

Send for this new 12 page illustrated catalog today. Contains full information on the complete Lufkin line of magnetic base tools.

BETTER MEASURE WITH LUFKIN
TAPES • RULES • PRECISION TOOLS
THE LUFKIN RULE COMPANY, Saginaw, Michigan 470

IT PAYS TO USE YOUR INDUSTRIAL DISTRIBUTOR
. . . He offers emergency 24 hour service

SEIBERT ADAPTERS

View of 350-ft. Cross-built V-8 cylinder block machine equipped with Seibert Adapters. Performs a total of 555 operations.

"Meet Our Standards Completely"

Says THE CROSS COMPANY • Detroit

● High production machine tools, like The Cross Company builds for the automotive industry, are a marvel in machining efficiency. All heads and tools must function smoothly and accurately within precision limits. Seibert "Shur-Lock" Adjustable Adapters, play an important part in maintaining the precision and efficiency required. For example, they are built to hold total concentricity within .002 (total indicator reading) 6" from end of the adapter—one reason why The Cross Company says, "Your production tools meet our standards completely." You can depend upon Seibert service, too. There is a Seibert man near you—ask for his phone number today.

CHECK THESE SEIBERT FEATURES

- Designed with convenient starting ring for easy installation.
- Relieved key seat eliminates swell, assures easier setups.
- Manufactured to GMC, Ford, Chrysler & ASA standards.
- Lot produced, economically priced.

New Tool Control Board—individually designed to suit your needs.

WRITE FOR ADAPTER BULLETIN, LATEST PRICE LIST

Ask for Folio 2-50. Gives complete specifications. Lists range of sizes available from stock. Ask also for brochure illustrating new control boards and complete line of holding tools.

800 Series Spindle Extension

900 Series Spindle Extension

Compression or Tension Tap Driver

Floating Holder

SEIBERT & SONS, INC. 1004 E. 24th STREET CHENOA, ILLINOIS

Quality MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS

SEIBERT

HOW OBSOLETE ARE *YOUR* MACHINES?

More than half-a-million machine tools and metalforming equipment units installed in the nation's metalworking industries are more than 20 years old. FROM THE SEVENTH AMERICAN MACHINIST INVENTORY OF METALWORKING PRODUCTION EQUIPMENT. Reprints at $1.00 each.

READER SERVICE DEPT., *American Machinist*
McGraw-Hill Building, New York 36, N.Y.

ULTRA-CHEX GAGE BLOCKS *for Every Need!*

Supplied in one Superior Accuracy
5 MILLIONTHS ± ACCURACY

34 BLOCK SET (shown) WITHOUT OPTICAL PARALLEL ... $125.00

82 BLOCK SET ..... $260.00 IN CASE

These sets will supply the needs of any discriminating shop that must work to gage-block precision. IMMEDIATE DELIVERY

9 Block Set
For Individual Mechanic
$24.75
OPTICAL PARALLEL $6.00 Extra

WRITE FOR ILLUSTRATED FOLDER

GEO. SCHERR CO., INC. 200 AM LAFAYETTE STREET • NEW YORK 12, N. Y.

YODER SLITTERS Supply Varied Strip Widths for Tinnerman *Speed Nuts*

Tinnerman Products, Inc., Cleveland, Ohio, produces more than 10,000 different shapes and sizes of "SPEED NUT" brand fasteners for industry . . . many of them to special specifications.

To do this, Tinnerman uses slit steel strands ranging in width from ⅛" to 7½". To carry an inventory of the many strip widths required to meet normal and unusual demands would be almost impossible.

Tinnerman overcomes these inventory and supply problems by doing their own slitting on two Yoder slitters. This enables them to supply the plant with any strip size required from a relatively small inventory of 6" and 9" width purchased coils. In slitting narrow strands, such as these from small coils, a Yoder slitter may be profitable on a production as low as 25 tons per month.

Here is a fine example of how a small investment in Yoder slitting equipment greatly simplifies and speeds production while effecting important operating economies.

The saving made in time alone, reflects in better customer service through faster completion and delivery of finished products.

If your steel strip or sheet slitting requirements are as low as 100 tons per month or even less, a medium size Yoder slitter can be a very profitable investment for you. The Yoder line includes units of every size and capacity . . . of the most advanced engineering design. Send for the Yoder Slitter Book —a comprehensive text on the mechanics and economics of slitters and slitting line operation, with time studies, cost analyses and other valuable data. Write to:

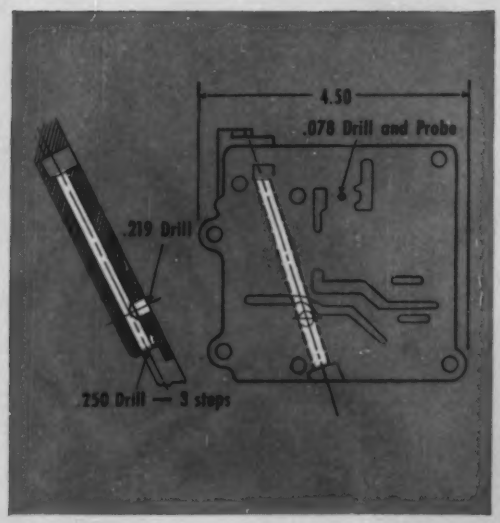
THE YODER COMPANY
5519 Walworth Avenue • Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING ROTARY SLITTING LINES

drilled and probed automatically in one chucking on a KINGSBURY

Case Study 3749

THREE HOLES IN THIS TRANSMISSION VALVE COVER . . . 5 OPERATIONS . . . 350 PARTS PER HOUR GROSS



The machine drills three holes in this aluminum die casting. The customer asked us to probe the tiny .078 hole as the best means of inspection. An air-actuated mechanical probe operates at the next station after this drilling. If the hole is not drilled, the probe trips a limit switch which stops the machine.

We pioneered in these indexing automatics and we still think we can build them better than anyone else. They will produce to your specifications. If you have critical high production drilling and tapping jobs, we'd like a chance to show you what we can do. Kingsbury Machine Tool Corporation, Keene, N. H.

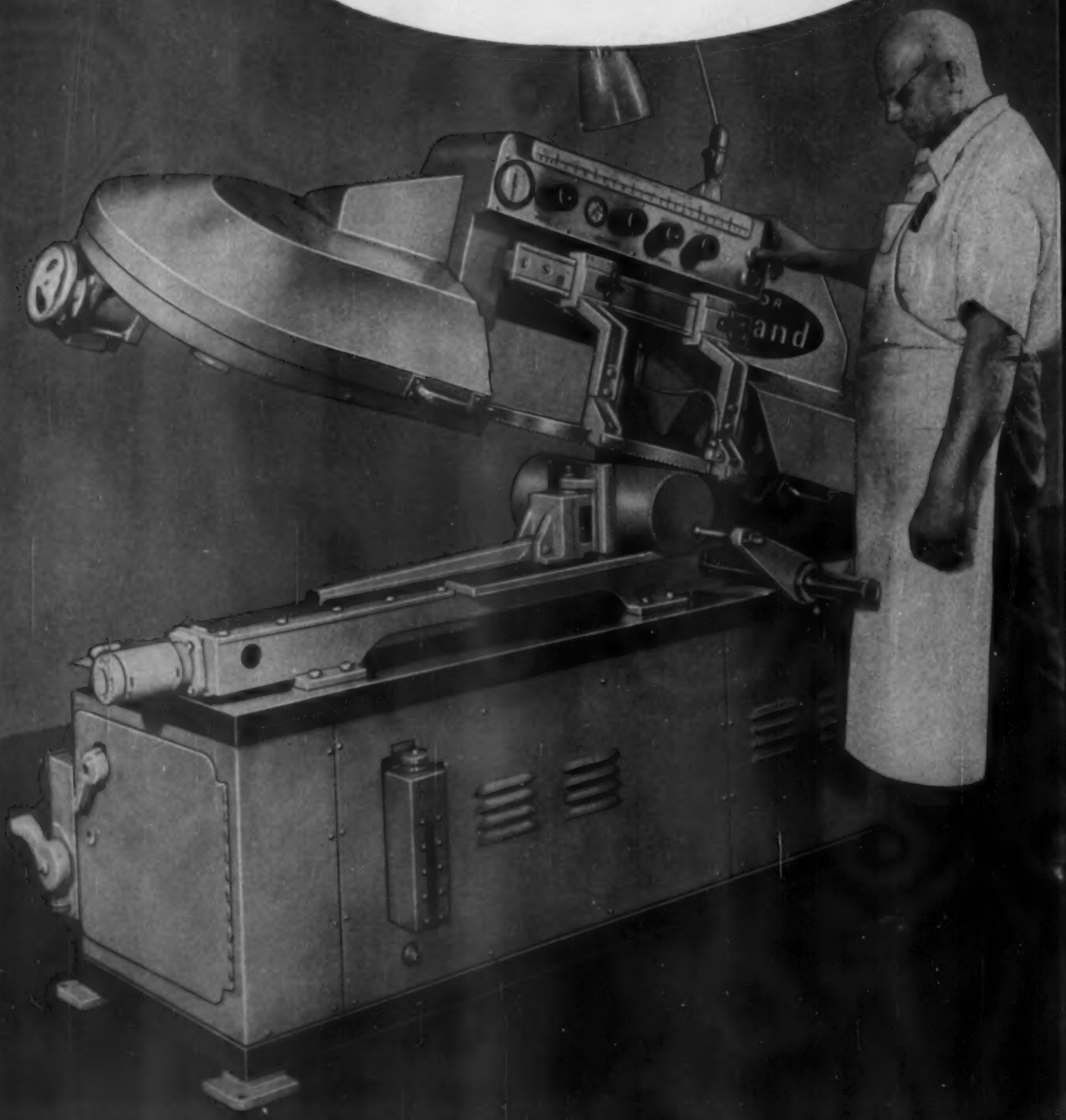
KINGSBURY
INDEXING AUTOMATICS
for high production drilling and tapping

Announcing the

MILFORD

REZISTOR

Milband



...the NEW Band Saw Machine that Meets Modern Cut-Off Requirements

The all-new MILFORD REZISTOR MILBAND was specifically designed to do a job that no conventional band saw machine can handle . . . utilizing and delivering the full potential cutting capacity of the MILFORD REZISTOR High Speed Steel Band Saw Blade!

The MILBAND is a rugged, heavy-duty machine designed and built for the fast blade speed and heavy feeds of which the REZISTOR Band Saw Blade is capable. A very wide range of variable blade speeds (40 to 360 fpm) provides the right setting for every metal. New hydraulic blade feed automatically compensates for greater blade resistance when cutting larger cross sections. Optional automatic indexing bar feed attachment provides fully-automatic operation, insuring maximum output at lowest cost.

Ideal for high-output cut-off sawing—even where stainless steel, super metals and other tough-to-machine alloys are involved—this blade-and-machine team now brings you faster and more *accurate* cutting . . . and important savings in chip loss compared with conventional cut-off methods.

The MILBAND and MILFORD REZISTOR . . .

the Machine and Blade Team for High Speed Production.

WRITE NOW FOR COMPLETE INFORMATION

SAW & BAND SAW BLADES · STOCK · HACK · HOLE SAWS · GROUND FLAT

MILFORD

THE HENRY G. THOMPSON & SON CO.

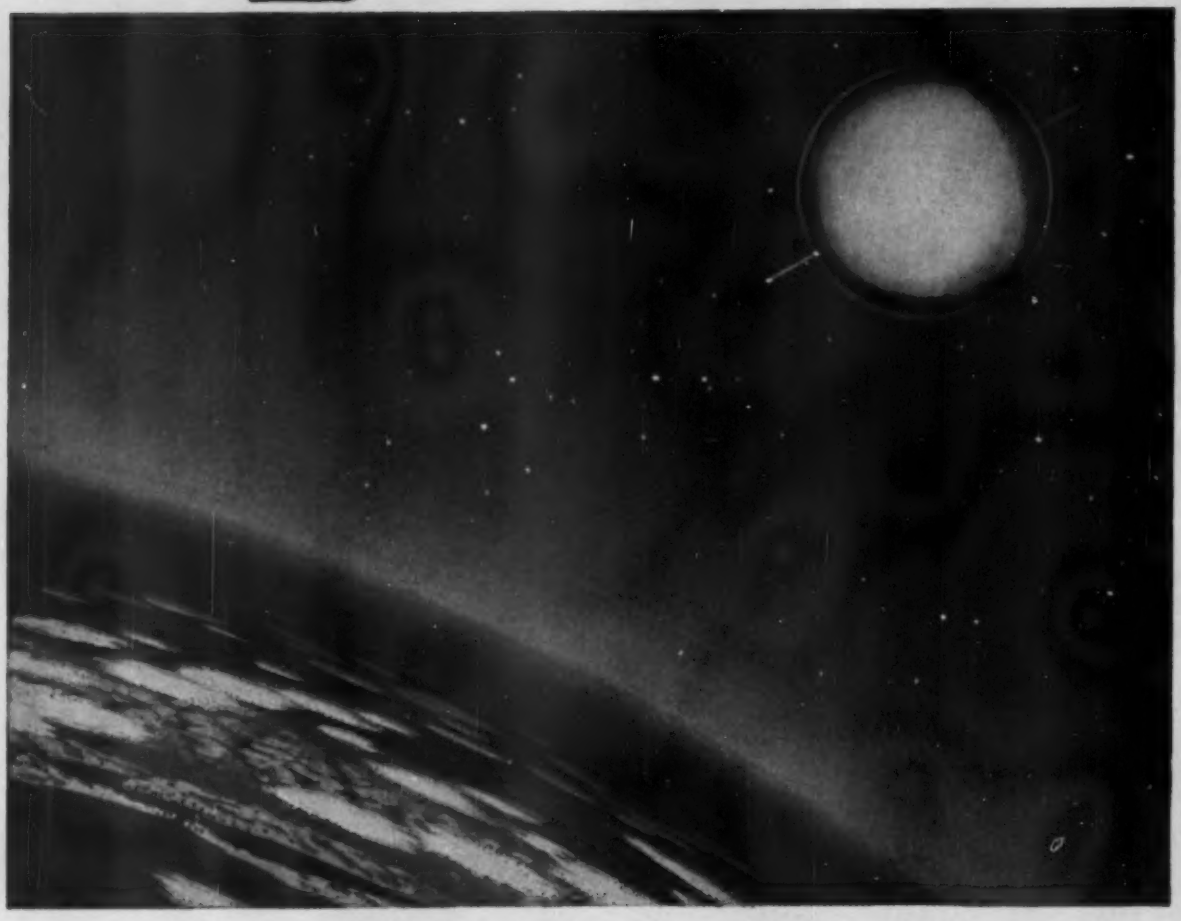
Saw Blade Specialists for Over 80 Years

NEW HAVEN 5, CONNECTICUT

SEE THE MILBAND

. . . at BOOTH 1545, NATIONAL METAL EXPOSITION, CHICAGO

A Touch here achieved so much



CHARTING THE WAY TO THE STARS...

A new iridescent point of light flashing through our skies at night will proclaim man's most radical step since the invention of the wheel. The Earth Satellite will be on course, electronically compiling information that will enable man to chart his way to the stars.

The electronic equipment will be housed in a sphere 20 inches in diameter. The sphere will be made in two parts, from a magnesium alloy, deep-drawn after spraying with 'dag'® 41, a colloidal graphite dispersion. A thin film of colloidal graphite covers the pre-heated sheets before insertion in the drawing press.

Final contour is achieved by spraying the hemisphere again with 'dag' 41; then spinning under torch heating and wood tooling until the hemisphere assumes the shape of the spin block. Both hemisphere and spin block are coated with 'dag' 41 to facilitate removal.

'dag' 41 prevents galling, scoring and metal pickup; its ease of application, film strength, lubricity and resistance to heat make it the perfect deep-drawing lubricant. Talk with your Acheson Service Engineer soon, for more detailed information, and write for Bulletin 426—Metalworking Applications. Address Dept. AM-11.

VISIT BOOTH 112 . . . NATIONAL METAL EXPOSITION
Chicago International Amphitheatre — November 4-8, 1957

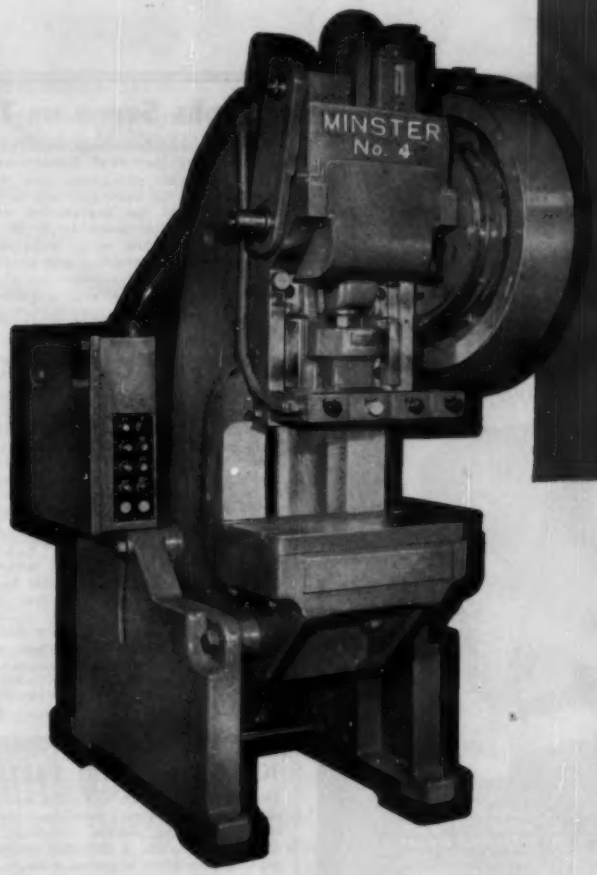
dag®

ACHESON COLLOIDS COMPANY

Port Huron, Michigan...also Acheson Colloids Ltd., London, England

ACHESON COLLOIDAL DISPERSIONS:
Graphite · Molybdenum Disulfide · Zinc Oxide · Mica and other solids

Offices in: Boston · Chicago · Cleveland · Dayton · Detroit · Los Angeles
Milwaukee · Philadelphia · New York · Pittsburgh · Rochester · St. Louis · Toronto



You Helped Design
The Improved

MINSTER O.B.I.

You, as a press user, have often told us what features *you* wanted in an O.B.I. to improve *your* press operations. Most of the design changes in this improved Minster O.B.I. are based on *your* ideas, desires and demands.

CENTRALIZED CONTROL CABINET CONVENIENTLY LOCATED . . . NEVER INCLINES

For convenience and better operation, control cabinet mounted on leg remains vertical when press is inclined; is subject to less operational shock and easier to maintain.

NEW LEG DESIGN PROVIDES MORE WORKING SPACE

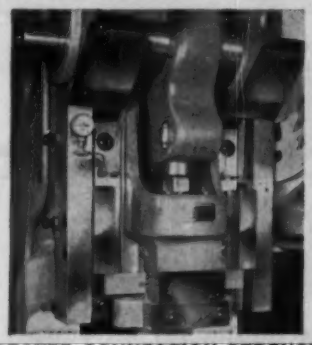
Square-cut legs give operator more room, a comfortable position in front of press. Inclining mechanism in leg and use of movable spacer rod provide more free space under press for tote pans or conveyors.

NUMBER	4	5	6
TONS CAPACITY	32	45	60

Flywheel or geared type. Drive can be mounted on either side. MINSTER patented Combination Air Friction Clutch and Brake Unit mounted within flywheel or drive gear on crankshaft.

HEAVIER FRAME FOR GREATER RIGIDITY, ACCURACY AND DIE LIFE

Frame closed in on top and front completely encloses bearing caps, thus providing better distribution of work forces. Connection cover keeps press cleaner—no oil drops hit operator.



GREATER CONNECTION STRENGTH —IMPROVED KNOCKOUT

Tail stock type connection screw locking. Increased connection strength and screw support.

T-Slotted Knockout blocks moving against frame surface give more positive knockout, are easier to adjust. No more bracket breakage.

FASTER, EASIER INCLINING

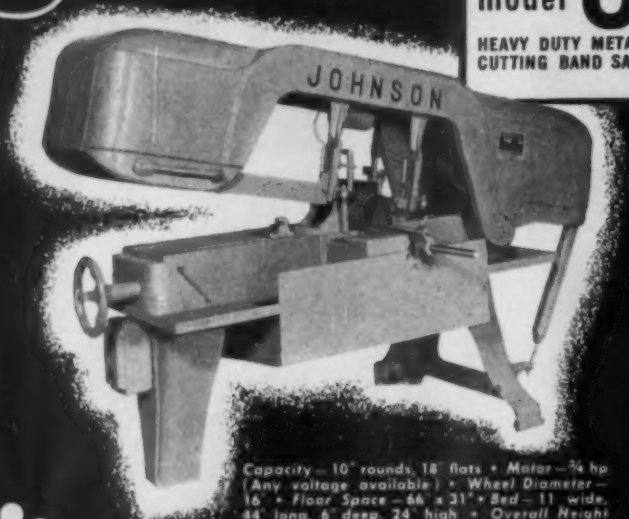
Inclining the press takes less time and labor with ratchet-wrench-operated mechanism located in press leg *at normal working height*. Die changes are made quickly in vertical position with greater safety, more accurate alignment and less die change-over time.

THE MINSTER MACHINE COMPANY • MINSTER, OHIO

COMPARE

and you'll get a BIG NEW Johnson model J

HEAVY DUTY METAL CUTTING BAND SAW



Capacity – 10" rounds, 18" flats • Motor – 3/4 hp. (Any voltage available) • Wheel Diameter – 16" • Floor Space – 66" x 31" • Bed – 11" wide, 44" long, 6" deep, 24" high • Overall Height (closed) – 39" • Weight – Approx. 750 lbs. • Speeds – 36, 90, 130, 190 feet per minute.

COMPARE the handsome, husky Jonhson Model J with any metal cutting saw and here's what you'll find:

- *Johnson leads the way in dependable, well-engineered, high performance band saws.*
- *A Johnson saw will cut anything in your stock pile, and do it faster.*
- *Johnson saws contain more exclusive construction and performance features that save time and money.*
- *Johnson saws are the finest metal cutting machines available anywhere—and, at the lowest price!*

COMPARE . . . and see for yourself how easily you can save time, labor and production dollars with a Johnson saw. Complete information, prices—are yours for the asking.

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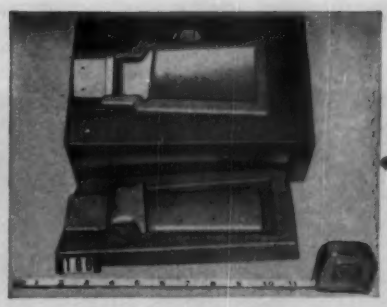
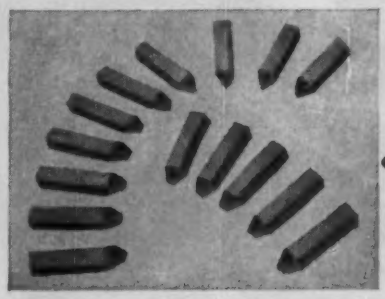
FORGING DIE

Material: Heppenstall 'A'
Conventional Machining
Time: 40 hours
Elox Setup & Machining
Time: 8 hours
Saved: 32 hours
Machine tool: Elox Standard M-500
Electrode: Cast Elo-met #3
Customers report 75% time saving in re-working dies after washout . . . no annealing is necessary.



TUNGSTEN CARBIDE SINGLE POINT TOOLS

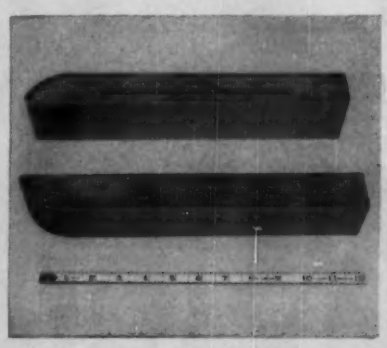
E D M produces 14 identically machined tools per hour. Times include roughing and finishing, machining both faces, nose radius and top. Radius held to ± .001". Tools were produced by 1 man operating 2 Elox Tool & Cutter Grinders, using a brass wheel. Users report Elox ground tools give greatly increased life when compared to abrasive ground tools.



EMBOSSING DIE

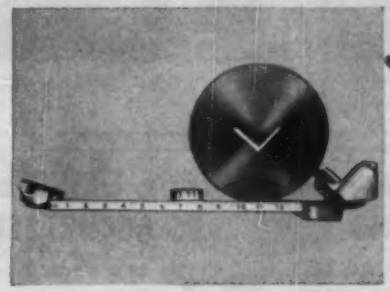
Material: Air Hardened Tool Steel
Die consists of 1,250 squares machined .100" x .030" deep in the bottom section of the die. Sharp corners on each square had to be maintained.

Conventional Machining
Time: 227 hours
Elox Setup & Machining
Time: 10 hours
Saved: 217 hours
Machine Tool: Elox Standard M-500
Electrode: Free machining brass



EXTRUSION DIE

Material: Air Hardened Tool Steel
Conventional
Machining Time: 4 hours
Elox Setup &
Machining Time: 1 hr. 38 min.
Saved: 2 Hrs. 22 min.
Machine Tool: Elox Standard M-500
Electrode: Free machining brass
Machining is done after final heat treating . . . eliminating the possibility of distortion.



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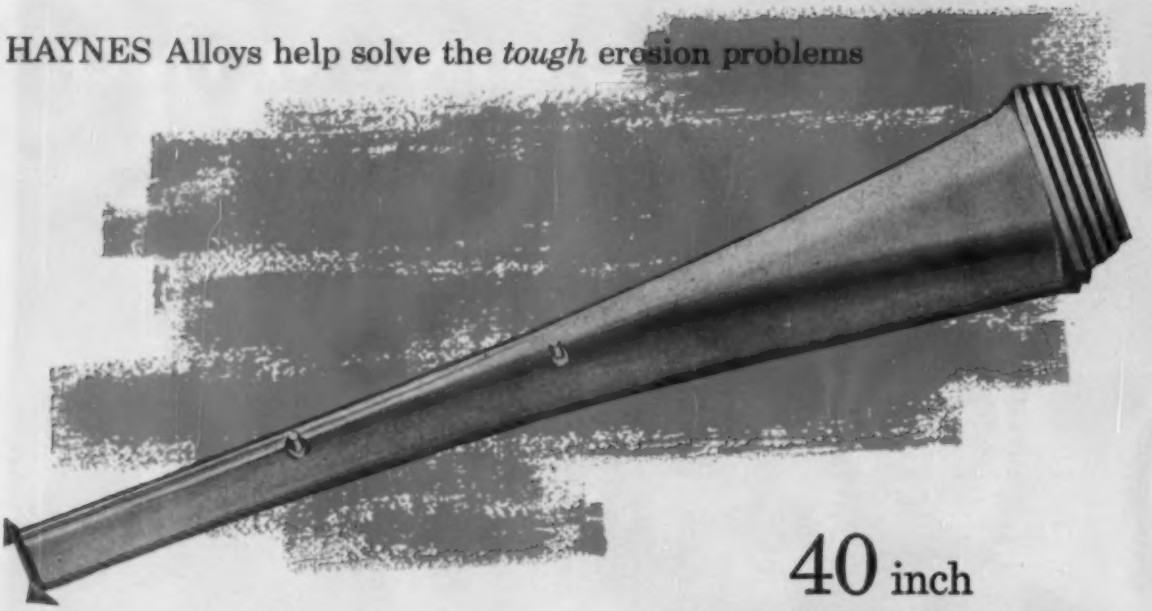

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For information on long-wearing and erosion resistant alloys, send for our Booklet. Write HAYNES STELLITE COMPANY, Division of Union Carbide Corporation, General Offices and Works, Kokomo, Indiana.

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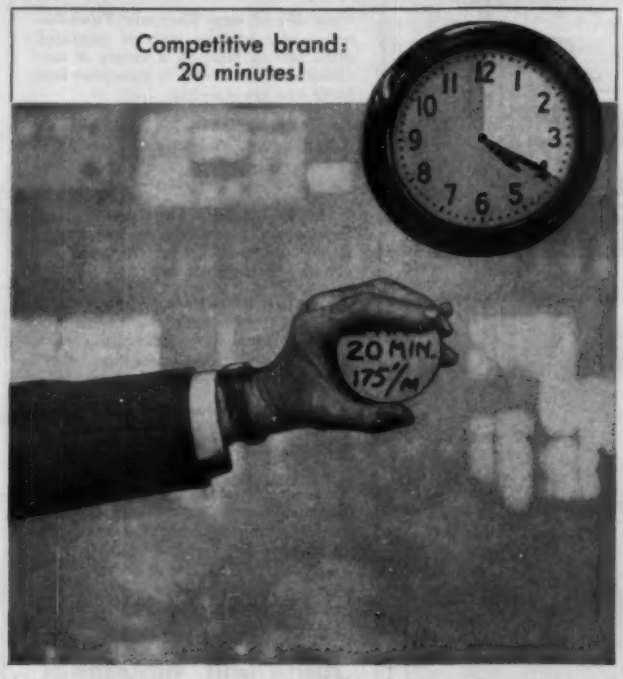

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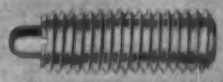

Standard
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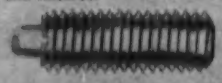

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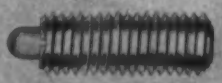

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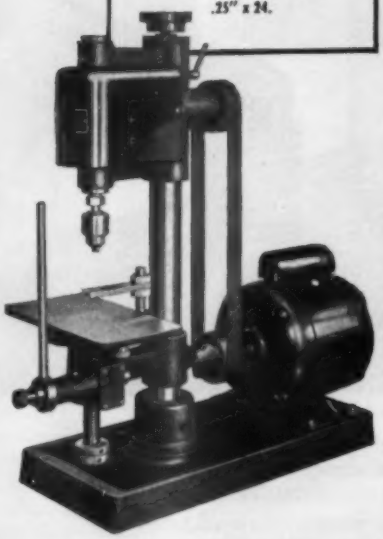

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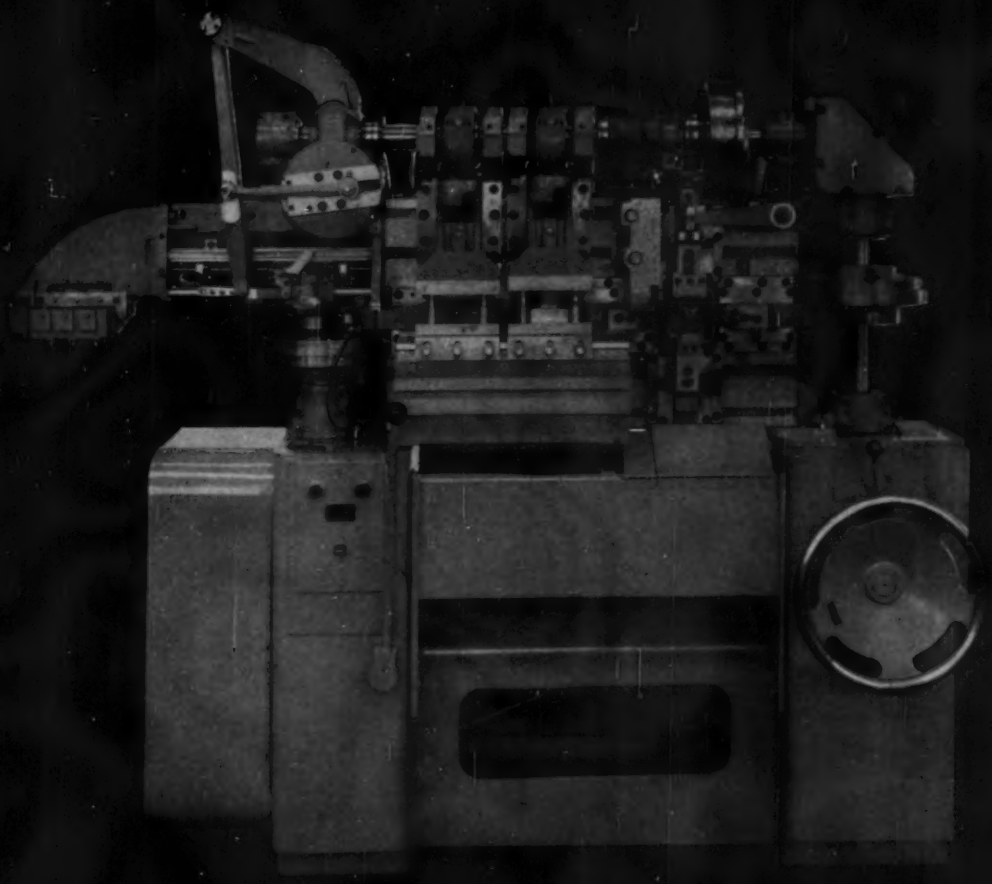
The Torrington Verti-Slide!

This important innovation in the basic field of 4-slide production equipment offers so many advanced design features, performance advantages and cost-cutting facilities that it is making national news as a development of major interest to U. S. industry.

NATIONAL NEWS

For the Torrington *Verti-Slide* was designed to meet a fundamental need for greater versatility, lower tooling cost, faster set-up time and reduced floor space. We urge you to investigate the *Verti-Slide* in detail at the Metal Show, Booth 1567, or through direct communication with our Machine Division.



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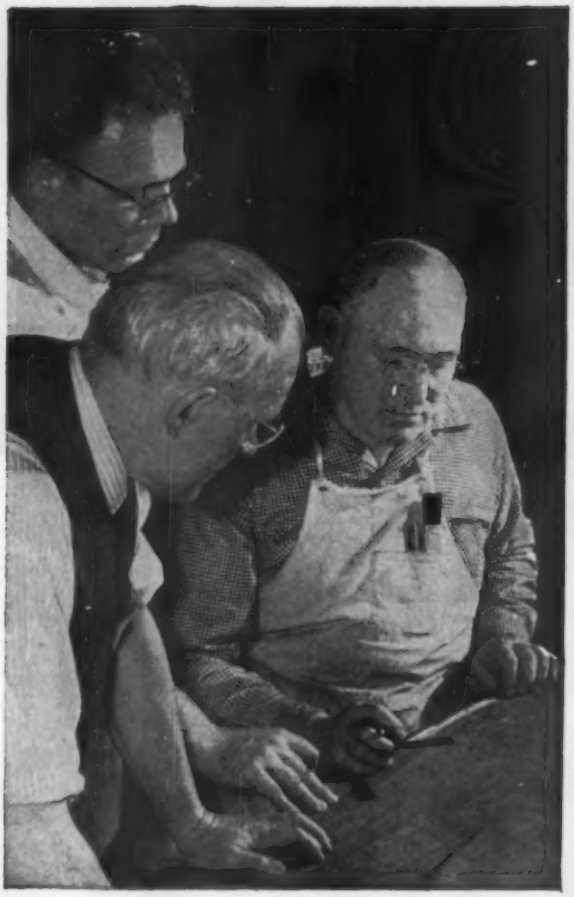

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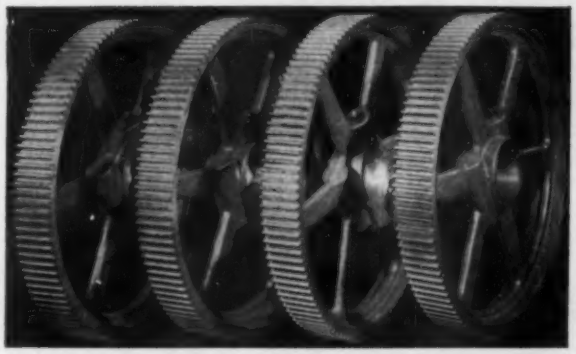

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In a comparison of A. O. Smith D-C rectifiers vs. M-G sets . . .

MOST WELDERS CAN'T TELL THE DIFFERENCE . . . ANY "COSTS MAN" CAN!

THERE'S LITTLE DIFFERENCE IN ARC ADJUSTMENT CHARACTERISTICS BETWEEN A. O. SMITH D-C RECTIFIERS AND M-G SETS — and a blind-fold test will prove it! With its arc booster arrangement, an A. O. Smith d-c rectifier can provide any of four characteristics at the flip of a switch — *booster on* for fast striking . . . *booster off* for quick work on routine jobs . . *smooth arc* for perfect welds on light gauges . . . and *forcing arc* for deep penetration. In effect, an A. O. Smith d-c rectifier provides most of the arc adjustments previously possible only with m-g sets.

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Your man from A. O. Smith will be pleased to arrange a demonstration. Contact him now. Or write direct for information.

A. O. Smith rectifiers are available in quality built 200, 300, 400, 600, 800, 1000 and 1250-amp models. Larger models for power applications may be had in up to almost any rating.

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WELDING PRODUCTS DIVISION

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TO INCREASE PRESS EFFICIENCY

MINSTER® CLUTCHES FOR PRESS CONVERSIONS

Combination Clutch and Brake unit mounted on crankshaft within flywheel as supplied for flywheel type gap or straight side presses.

MINSTER Combination Air Friction Clutch and Brake — made by a press manufacturer who knows your problems.

Combination Friction Clutch and Brake unit mounted on drive shaft within flywheel for geared presses.

Here's why it is profitable to convert to Minster Clutches:

- Eliminates down time because of clutch failure
- Reduces maintenance by eliminating costly and frequent parts replacement
- Increases die life because of smooth, shock-free clutch engagement
- Reduces operator fatigue and improves safety because press is easier to operate, easier to control
- More productive cycles per hour on single cycle operation
- Easier, more rapid die setting

Investigate the advantages of the Minster patented Combination Air Friction Clutch and Brake if you are considering modernizing your machines. Naturally, a new clutch unit will not make a new machine out of your old press. However, if your equipment is in good condition, or can be reconditioned reasonably, a Minster Clutch is the most profitable way for you to increase efficiency.

Ready to install: Minster conversion units are standard clutches, individually applied to your press. You receive the unit engineered to fit your press, complete with new flywheel and shaft as needed, ready to drop into place. This eliminates costly remachining and reworking of parts, saves down time for converting. A wide selection of Minster built electrical control systems is available.

Bulletin CC 57 describes Minster Clutches for press conversion. Copy by request on company letterhead.

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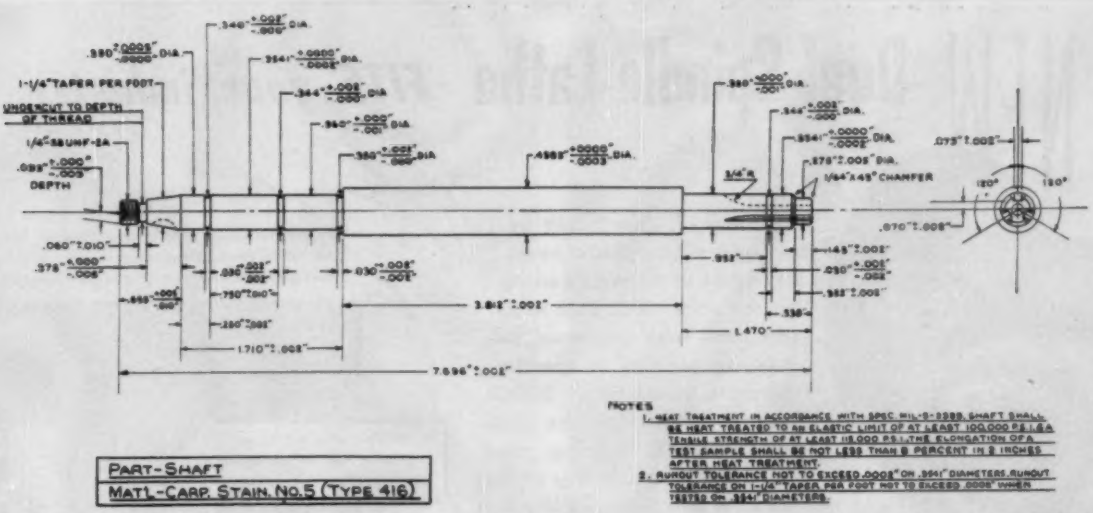
From the *American Machinist* Library of *Tips for Top Shop Men*

THERE'S an old saying that "If you want to be big, you've got to look big." Nobody likes a fourflusher or a fop, but everybody has been trained from childhood to expect a leader to look like one. Company policy can't earn respect on the major things either, if it is small on the minor things. Don't make your company look small.



NOTES
1. HEAT TREATMENT IN ACCORDANCE WITH SPEC MIL-S-6389. SHAFT SHALL BE HEAT TREATED TO AN ELASTIC LIMIT OF AT LEAST 100,000 P.S.I. & A TENSILE STRENGTH OF AT LEAST 115,000 P.S.I. THE ELONGATION OF A TEST SAMPLE SHALL BE NOT LESS THAN 8 PERCENT IN 2 INCHES AFTER HEAT TREATMENT.
2. RUNOUT TOLERANCE NOT TO EXCEED .0005" ON .3541" DIAMETERS. RUNOUT TOLERANCE ON 1-1/4" TAPER PER FOOT NOT TO EXCEED .0008" WHEN TESTED ON .344" DIAMETERS.

PART - SHAFT
MAT'L - CARP. STAIN. NO. 5 (TYPE 416)

For unmatched precision, *Carpenter* free-machining stainless

In one company which specializes in fine precision products made on automatic swiss type screw machines, finishes required run as close as 4 microinches; tolerances to 0.000025". After running into trouble frequently with stainless steels supplied by customers, the company released this statement:

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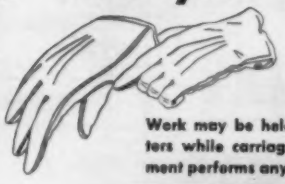

Work may be held stationary between centers while carriage-mounted milling attachment performs any wanted milling operation.

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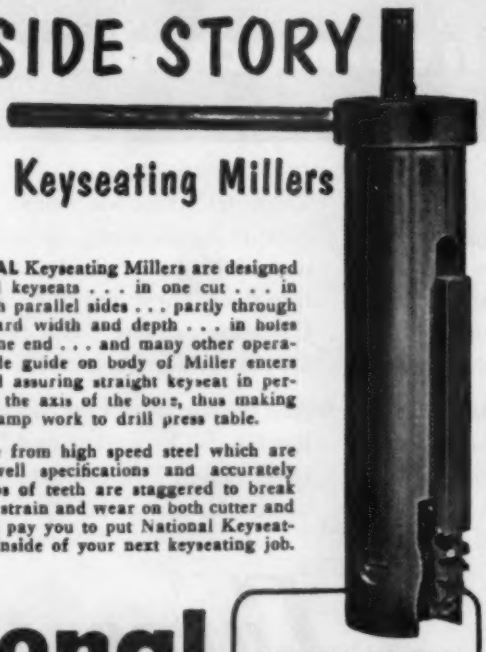
The INSIDE STORY about NATIONAL Keyseating Millers



NATIONAL Keyseating Millers are designed for milling internal keyseats . . . in one cut . . . in offset holes . . . with parallel sides . . . partly through holes . . . of standard width and depth . . . in holes that are closed at one end . . . and many other operations. A demountable guide on body of Miller enters keyseat being milled assuring straight keyseat in perfect alignment with the axis of the bore, thus making it unnecessary to clamp work to drill press table.

CUTTERS are made from high speed steel which are hardened to Rockwell specifications and accurately ground to size. Tops of teeth are staggered to break chips which reduces strain and wear on both cutter and driving pins. It will pay you to put National Keyseating Millers on the inside of your next keyseating job.

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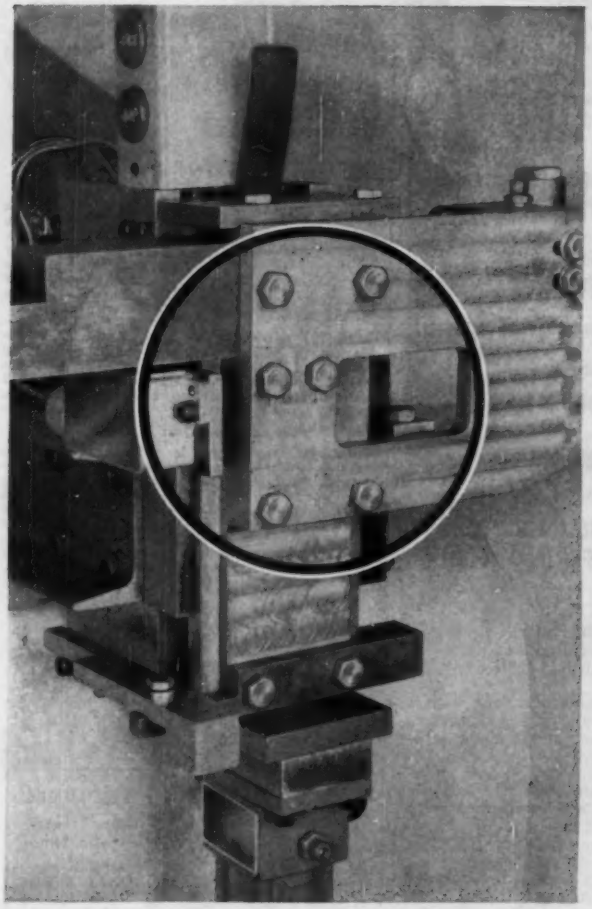
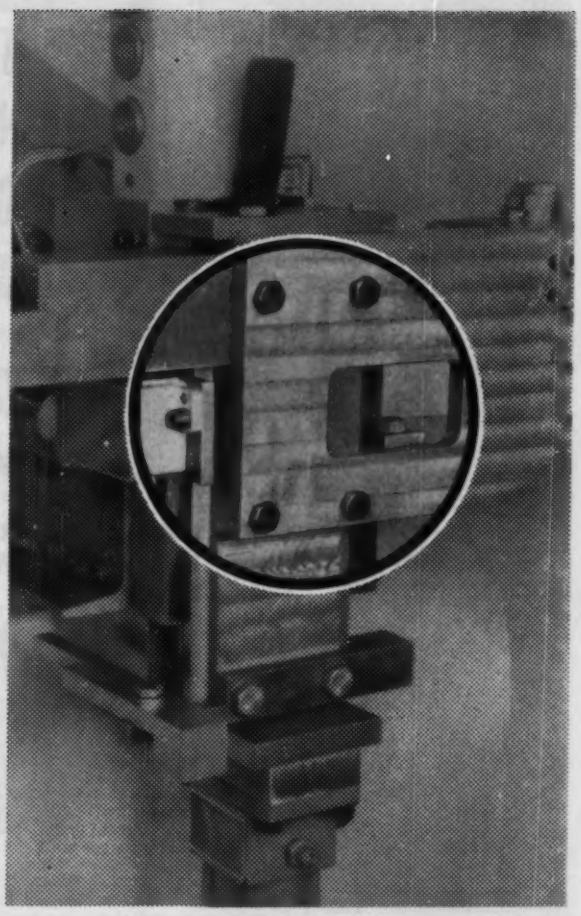




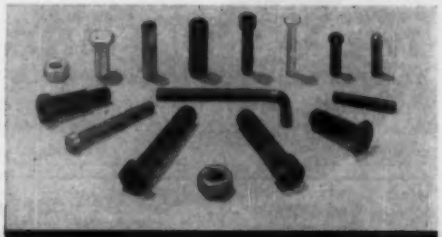
Cuts fastener costs 37% with CHICAGO heat-treated cap screws

Six ⅜″ bright cap screws were being used for the support plate assembly of this automatic transfer mechanism. CHICAGO's fastener specialists showed four 5/16″ heat-treated cap screws would do the job more efficiently—eliminating two fasteners and substituting a smaller size.

Using heat-treated cap screws here cut total fastener costs 37%! And in eliminating two extra fasteners, important additional savings were made by reducing machining and assembly time.

It will pay you to investigate savings for your products with these stronger fasteners. In addition to their greater strength, CHICAGO heat-treated cap screws provide extra advantages of Carbon Restoration—the special, scientifically controlled process which assures superior resistance to fatigue, wear, shock, and vibration.

Your CHICAGO distributor carries large stocks of heat-treated cap screws. And he will gladly arrange a study of your particular application by our fastener specialists. Call him today.



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Machines both ends Simultaneously. Holds within .005 on length.

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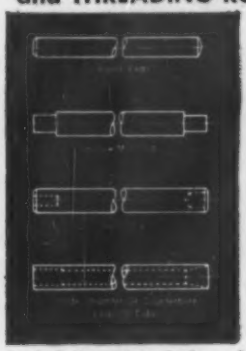

Typical Operations Performed on TYPE 5200 Double End Automatic Pointing Machines

The Type 5200 Automatic Double End Machine performs operations for which it is suited on diameters of 1/4" through 1-1/2" and lengths 1-1/2" to 30".

Production rates up to 3600 pieces per hour with a stud hopper, easily adjusted for lengths and diameters are possible. For short lengths, an independent automatic hopper feed can be provided.

Spindle speeds and feed rates are infinitely variable within the ranges built into the machine. Feed rates and length of cut of each head are independently controlled. Lengths can be held to .001" per head.

The machine stops automatically, preventing damage to tools, in the event of part jamming. Simple push button operation clears machine to resume operation.

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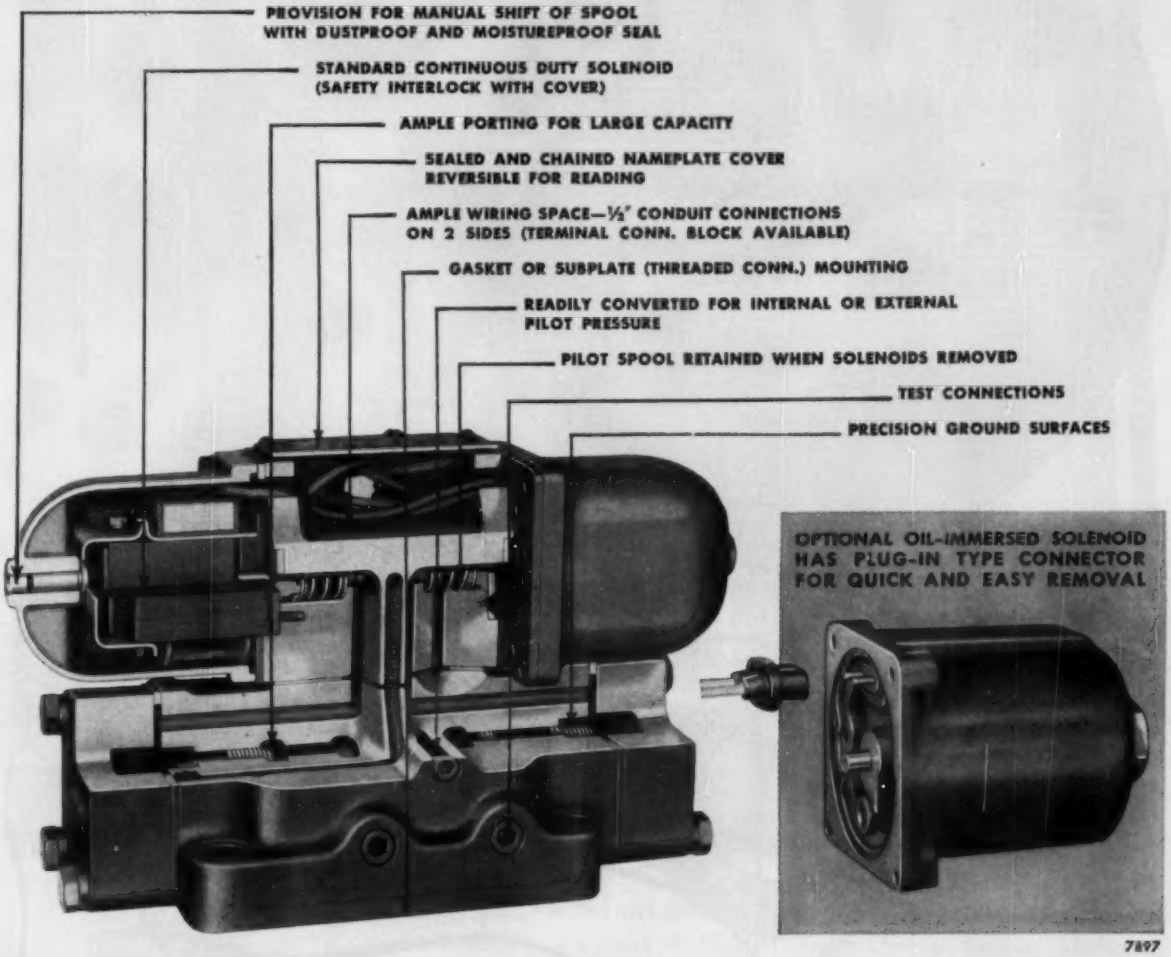
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The valves conform to JIC Standards and are available in ⅛" and ¼" direct solenoid operated models . . . ¾", 1¼", 2", and 3" solenoid controlled pilot operated models. These valves cover the flow range from 1.25 gpm to 320 gpm.

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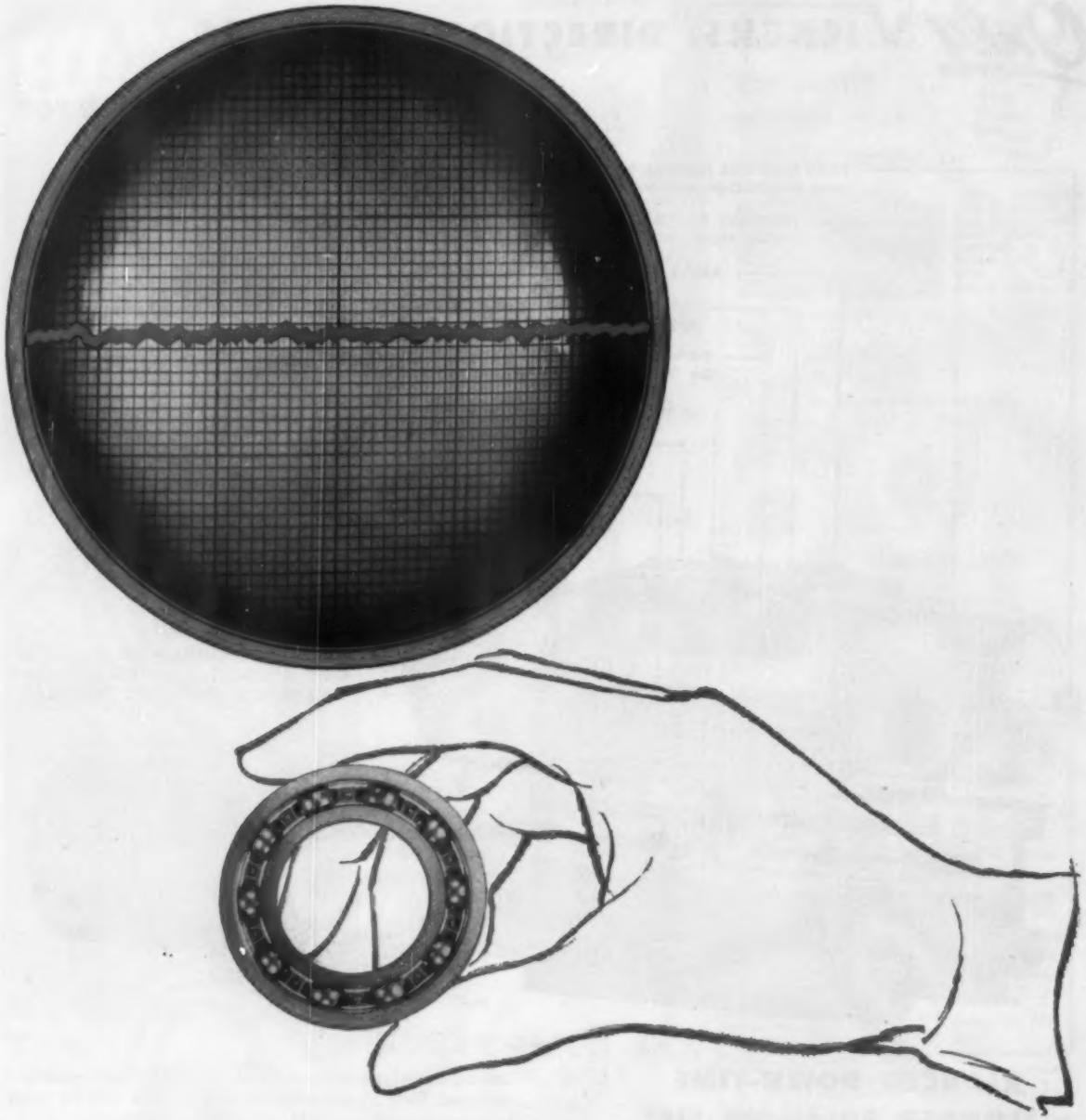

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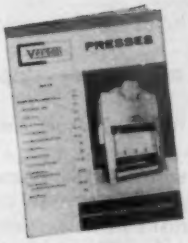
OFFERS YOU VERSATILITY TO MEET THE BROADEST NEEDS

A typical job at Westlof Tool & Die Co. — die tryout on progressive tooling. The press is also used for die tryout on Transmat type tooling.



Catalog G-57 presents basic data on all types of Verson presses. Write for your copy.

Die tryout for a tool and die shop is probably one of the severest tests of the versatility of a press. At Westlof Tool & Die Co., Detroit, Michigan, a 300 ton Verson double crank, straight side press is used for this purpose.

The press itself incorporates several features which are examples of the versatility Verson engineering can provide: The ram is equipped with three triple bank cushions adjustable right or left to 7" centers. The bed has two large cushions, one right, one left. All cushions are independently controlled. The press is equipped for application of coil feeding equipment should it become necessary. Press speed is variable from 15 to 30 strokes per minute. Power adjustment of the slide is 15".

If your requirements call for great versatility, bring your problem to Verson. For specific recommendations, just send an outline of your needs.

A Verson Press for every job from 60 tons up.

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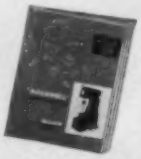

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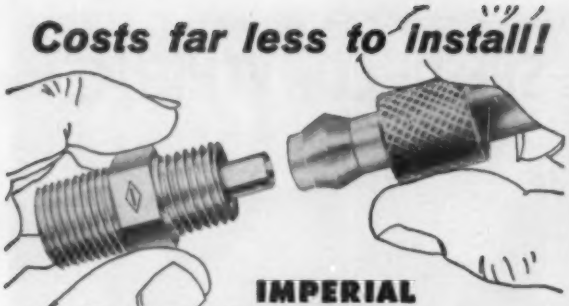

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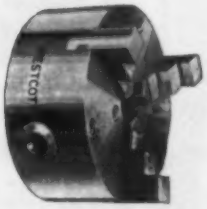

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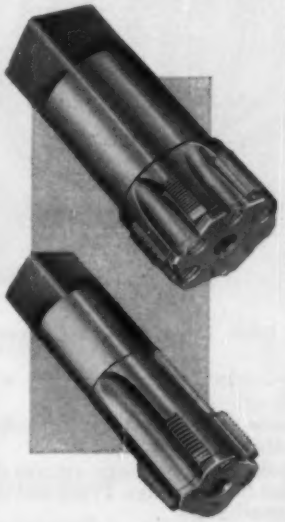

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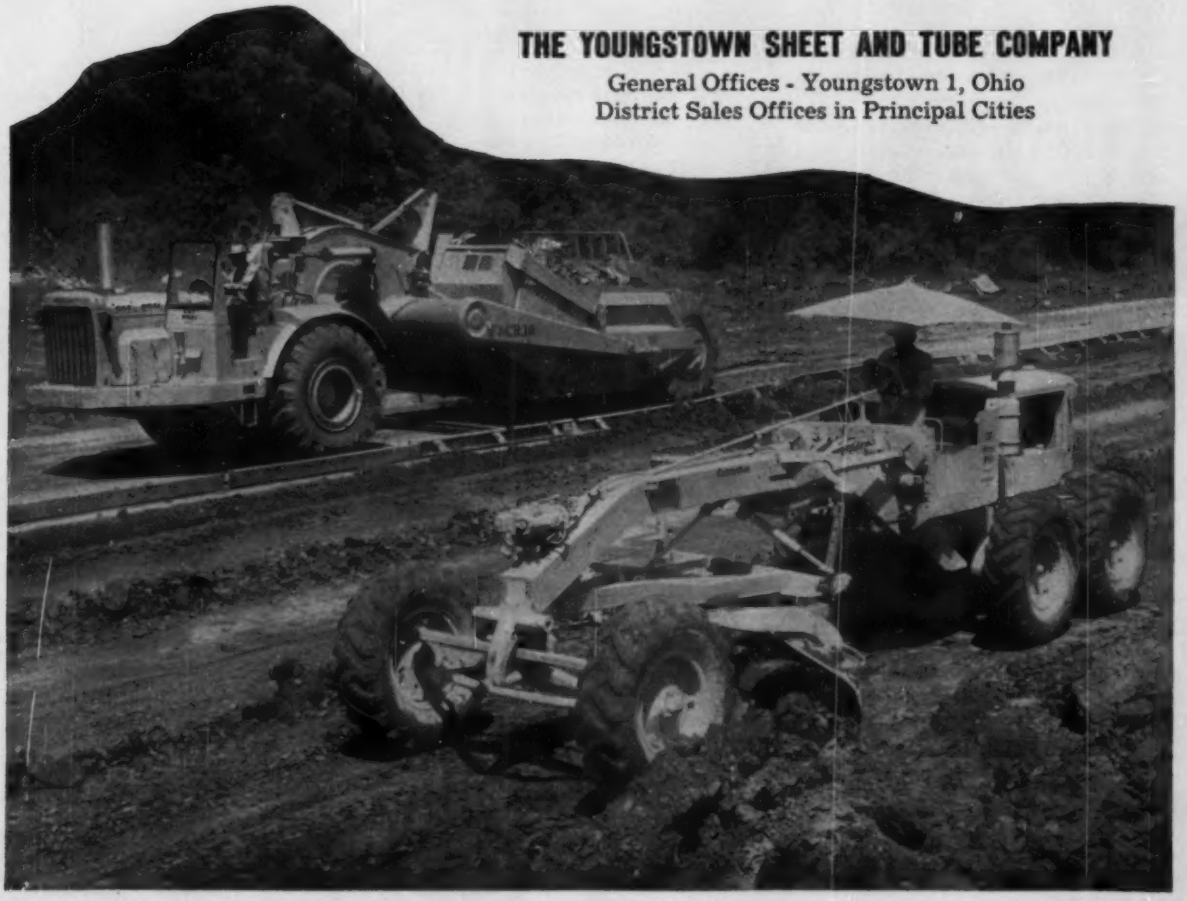

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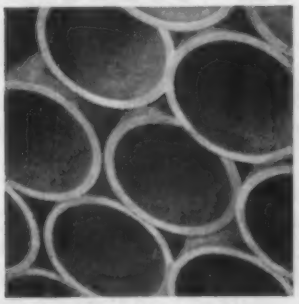

Pictured here is a close-up of part of a production run of tubing cut with an Allison Abrasive Cutting Wheel

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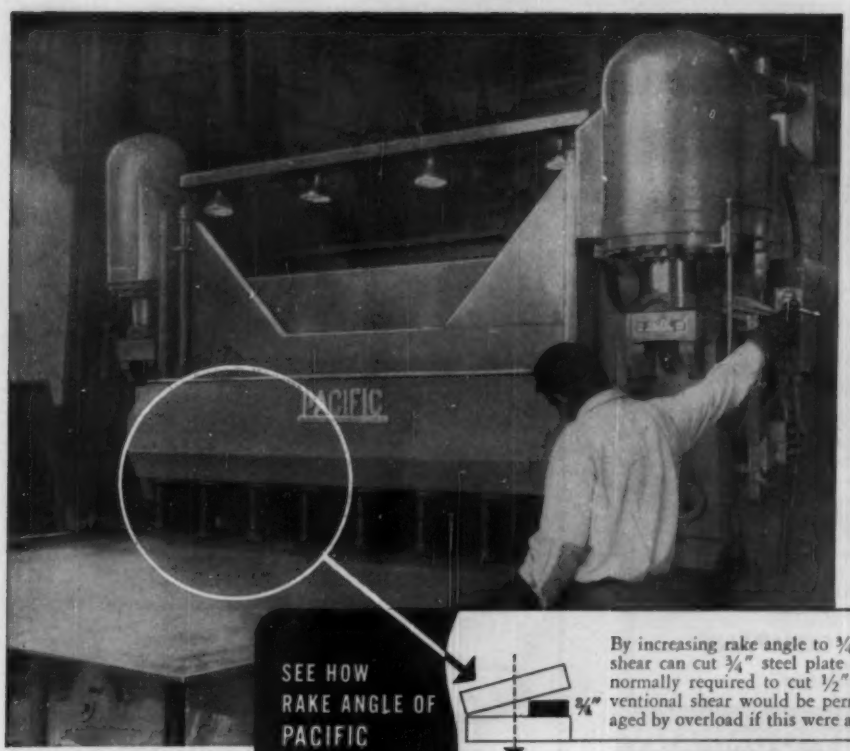

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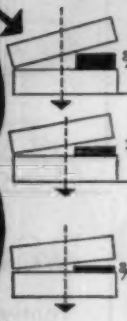

By increasing rake angle to ¾" per foot the shear can cut ¾" steel plate with the force normally required to cut ½" plate. A conventional shear would be permanently damaged by overload if this were attempted.

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ABOVE, RIGHT: *¼" plate cut with Pacific adjustable rake shear*

ABOVE, LEFT: *¼" plate cut with conventional shear*

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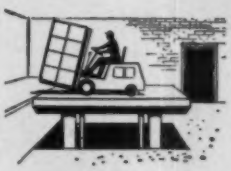

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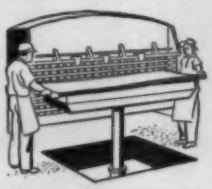

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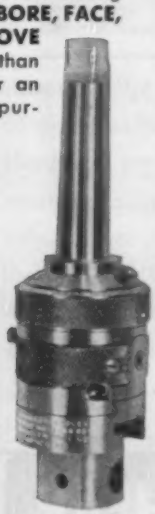

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THE SURPLUS MACHINERY MARKET

• **Business across the country** is "definitely picking up after a very dry spell." Not that there are more shoppers in the market, in fact there seem to be fewer, if anything. But the ratio of sales to quotes has improved remarkably in recent weeks, indicating that the huge volume of "fishing expedition" calls and letters, aimed at getting market information, has been replaced by prospects ready and willing to buy. That's the general picture, but sales vary widely with local conditions.

One Midwestern dealer reports selling four milling machines to a company that all summer long had been shopping on a much lower level and that overnight decided to buy late-model equipment.

Another outfit, which deals solely in late-model, top-grade machines, reports that business has been picking up slowly since the beginning of September, and is hopeful that volume will at least hold to present levels throughout the rest of the year.

Conversely, another dealer claimed excellent business in normally slow July and August, but says that sales slowed down as of September 1. And, paradoxically, this same dealer finds that conventional machine tools, even top-quality, late-model ones, are moving slowly. It's the "oddball" items needed to fill gaps in plant production lines that are moving well, he says.

These two directly contradictory dealer reactions—one reporting a pickup starting September 1, the other a drop beginning on the same date—pretty well sum up the area-by-area variance in used machinery sales across the country.

• **The West Coast today is a study in contrasts.** While Los Angeles-San Diego area dealers are suffering along with the cutback and changeover-stricken aircraft industry, dealers are doing a land office business up in San Francisco, a city geared to a variety of metalworking industries, rather than to one.

One of the biggest San Francisco dealers reports that he is doing double the amount of business he did three months ago, that his current inquiries are the highest in history.

The heightened number of inquiries, he says, indicates that customers are shopping much more extensively than they have in the past. Whereas a year or so ago, small shops were eager to get machinery to meet contracts, today they're proceeding warily—becoming more and more fussy about what they buy, and going in for late-model equipment rather than for museum types in which they might have invested unhesitatingly a year ago.

Best sellers out on the West Coast are such specialty machines as hones, fabricating equipment and special grinders. Moving well, too, are engine lathes, testing and precision equipment.

Some firms involved in defense work, notably those doing electronic work on missiles, are still buying used machinery actively, but those companies that have diversified out of defense work into other fields are buying still more. One source of used machinery business that has virtually dried up is the small basic machinery and tool and die shop (3 to 15 employees) that has been hardest hit by defense cutbacks.

• **Machinery Dealers National Association reports** that while used machine tool sales dropped off 8.6% in July 1957 as compared with June 1956, sales of tools invoiced at $200 or more each increased 2.2% in the same period.

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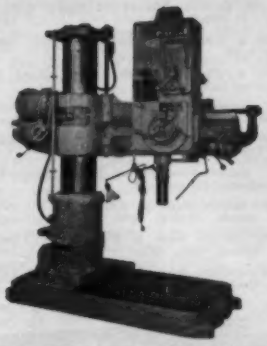
No. 56-90 CINCINNATI Duplex Hydromatic Mill, Late Type.

No. 0-8 CINCINNATI Horizontal & Vertical Prod. Mills, M.D.

No. 34-36, 45-48, 48" Cincinnati Duplex Mills. Late Type.

No. 2HL KEARNEY & TRECKER Horiz. Mill, M.D., Late Type.



3' x 11", 3 x 13" Col. CINCI-BICKFORD "Super Service" Radial Drill. Motor on Arm.

No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D. Late.

No. 3, 4 CINCINNATI HSDT Horiz. Mills, Vert. Heads Extra Table Travel, 1945.

No. 1-14 KENT-OWENS Hydraulic Prod. Mills M.D., Late Type.

10'x3/16" Clec. 18" Gap Power Shear, Late

8'x¼" Niagara Power Shear, M.D. 2½" Gap.

PRESSES

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3W WATERBURY FARREL Hi-Speed Blanking, 60 Tons Cap., 1½" Stroke, Reeves Drive.

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30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

4" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

No. 5 BROWN & SHARPE Hyd. Surface Grinder 8" x 24". Late Type.

No. 13 BROWN & SHARPE Univ. Tool & Cutter Grinder, Late Type.

MISCELLANEOUS

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1 spindle No. 2MA6 Avey High Speed, m.d., 7½" overhang, 1943
No. 2B—6" H.D. Edlund, H.P., m.d.
2 spindle Atlas Bench Type, 1942
2 spindle Allen, Belted m.d., 8" overhang
2 spindle No. 2 Avey High Speed, belted m.d.
2 spindle No .2B MA1 Avey Production Type, m.d.
2 spindle No. 3 MA6 Avey High Speed, m.d.
2 spindle No. 2 Leland-Gifford High Speed, 8" overhang, m.d.
2 spindle Leland-Gifford High Speed Hydraulic Type, m.d.
No. 2LMS Leland-Gifford, single spindle, H.S., m.d.
3 spindle No. 2 Avey, belted m.d.
3 spindle No. 3 Foot Burt, 1943
3 spindle No. 2B-6 Edlund H.S., m.d.
3 spindle No. 2MA6 Avey H.S., m.d.
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3 spindle Leland-Gifford H.S., m.d.
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5 spindle Allen H.S., belt drive
8 spindle Leland-Gifford, m.d. on each spindle, No. 2 taper
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6 spindle No. ½ MA 6 Avey H.S., m.d.
No. 20¼ Barnes H.D., 1945
Walker Turner H.S., vee belt drive
4 spindle Dumas High Speed, individual m.d.
4 spindle No. 2BMA-6 Avey H.S., m.d.

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2 spindle Meline Adjustable Rail
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6 spindle Model M1613 Pratt & Whitney In Line Vertical Drill
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No. 924 Barnes Vertical Drilling, Boring, Facing & Reaming Machine
Model C 16 Natco Adjustable Multiple Spindle Drill, m.d.

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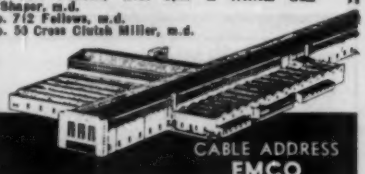

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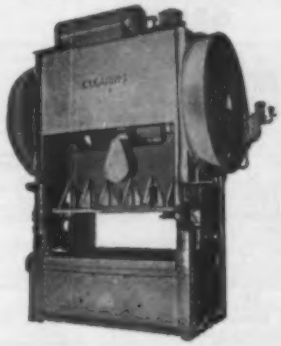

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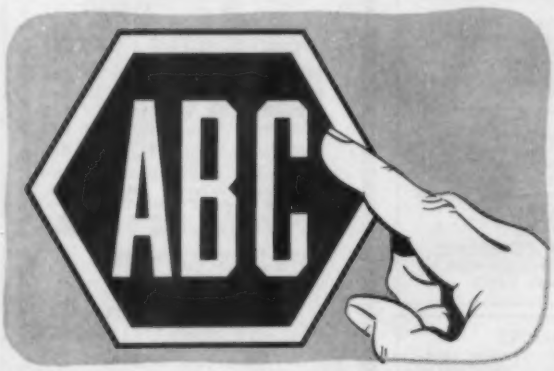

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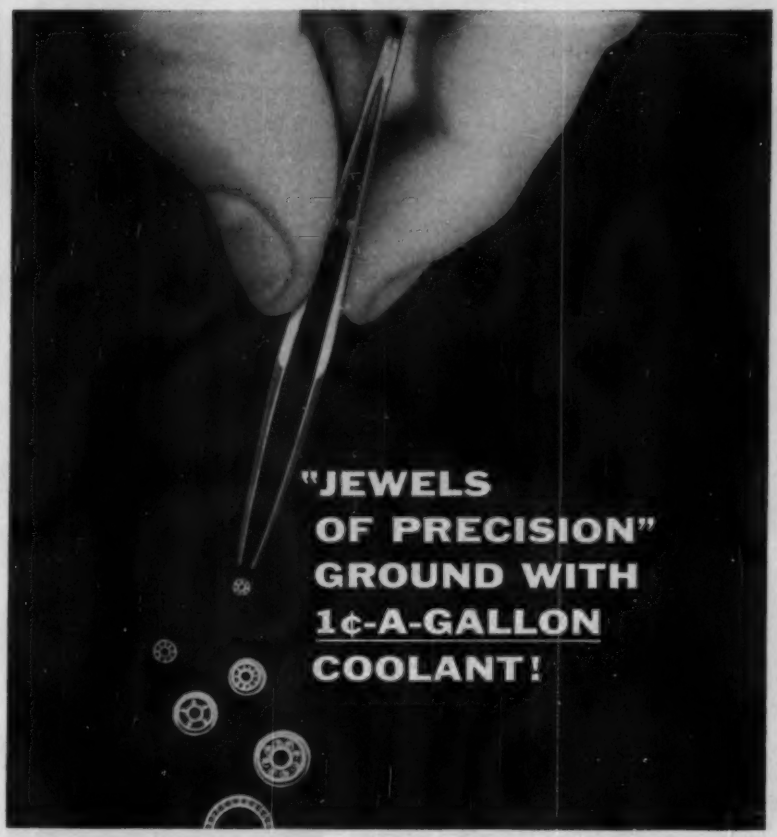

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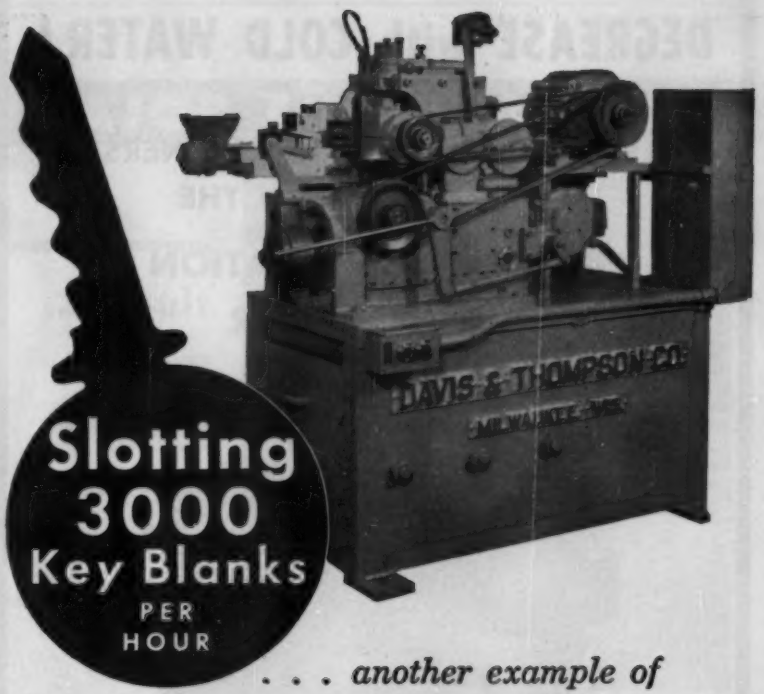

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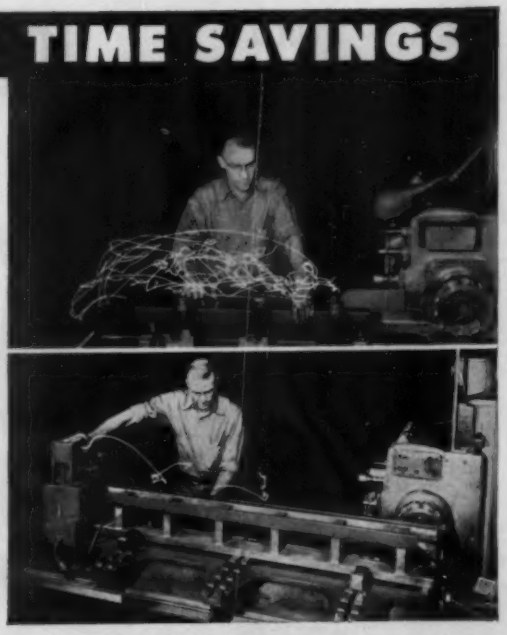

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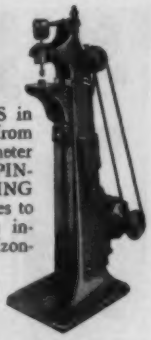

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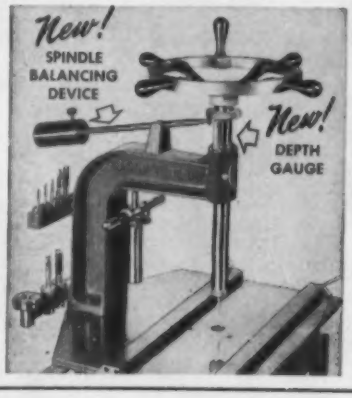

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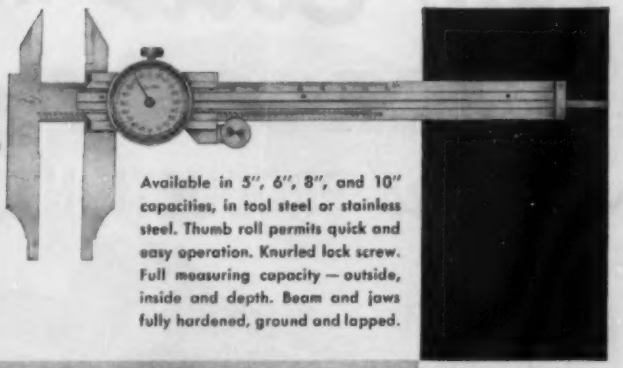

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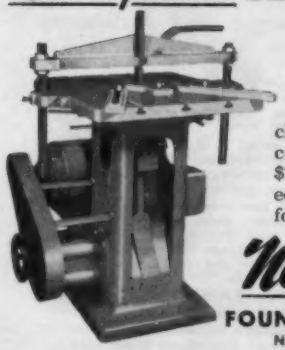

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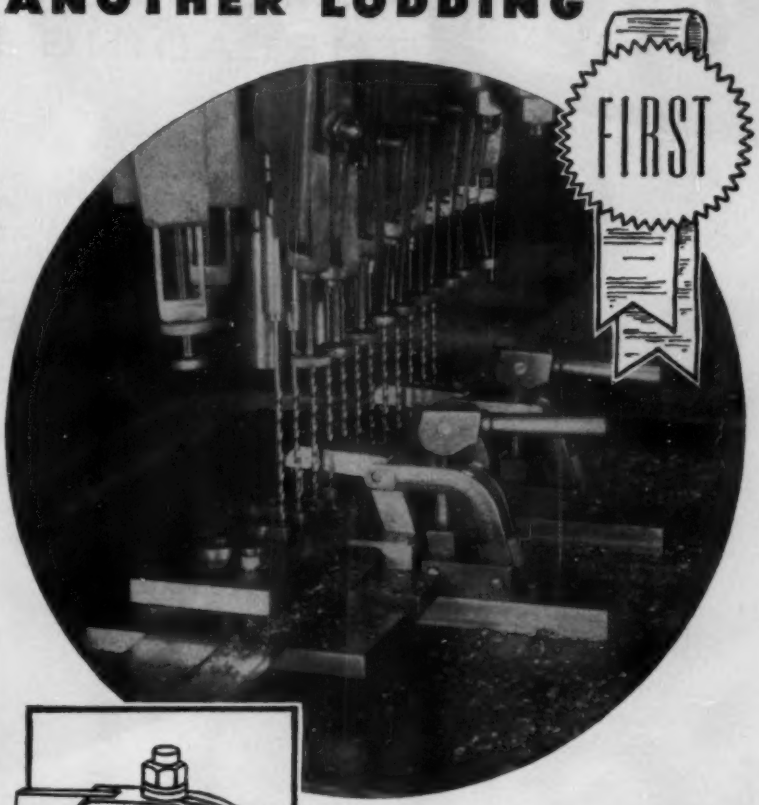

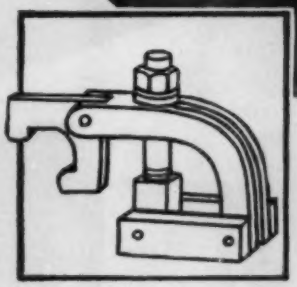

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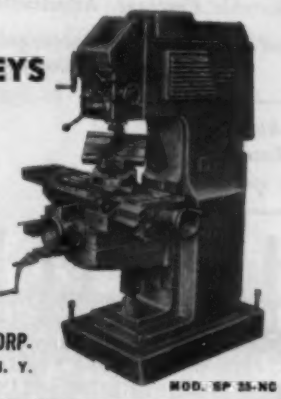

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Wide Speed Range: The Acme Model HA has eight spindle speeds assuring correct speeds for various diameters and materials to be threaded.

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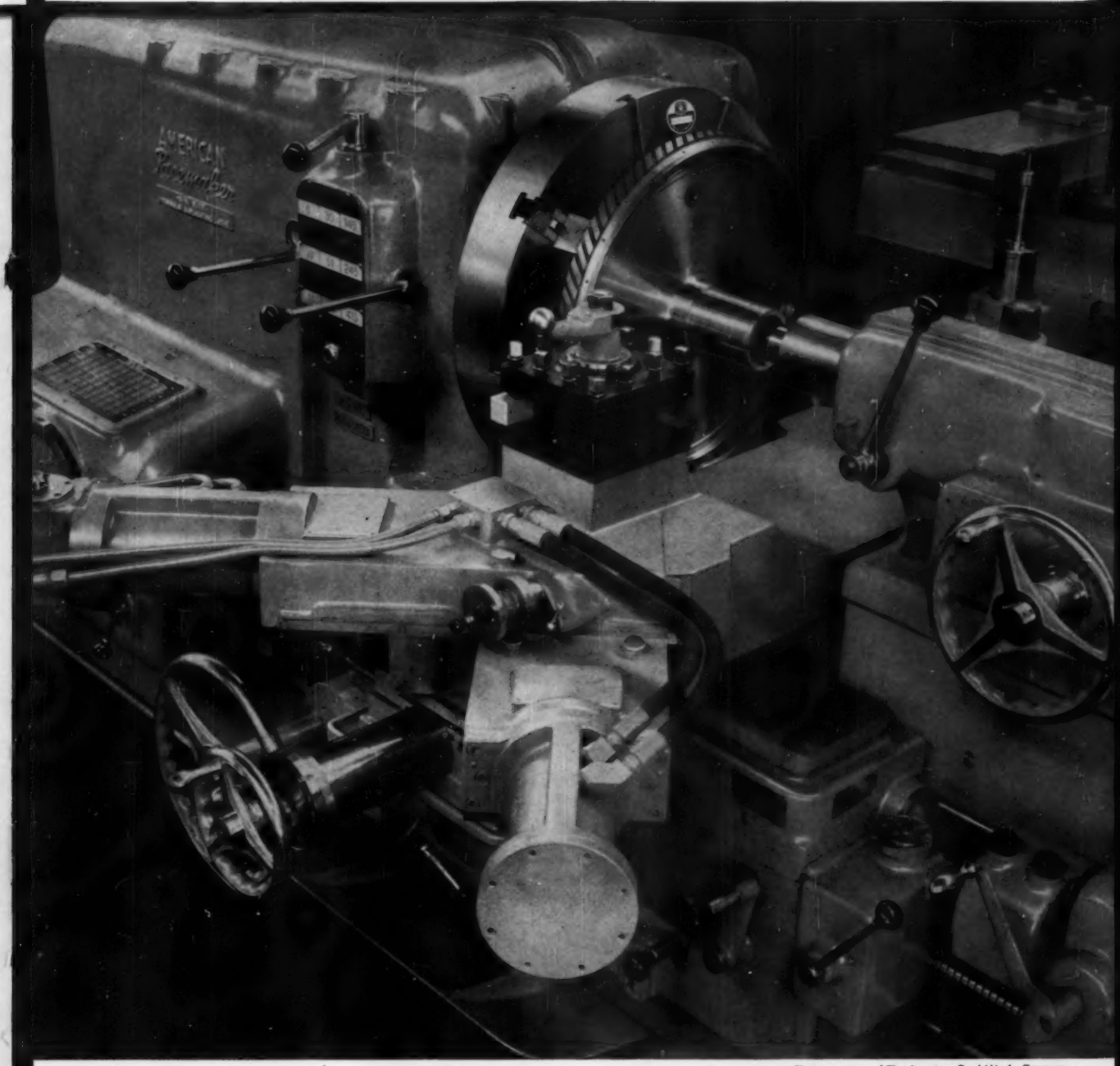

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THE LATHE — *American Pacemaker 25" Style "G" Hydraulic Duplicating Lathe*

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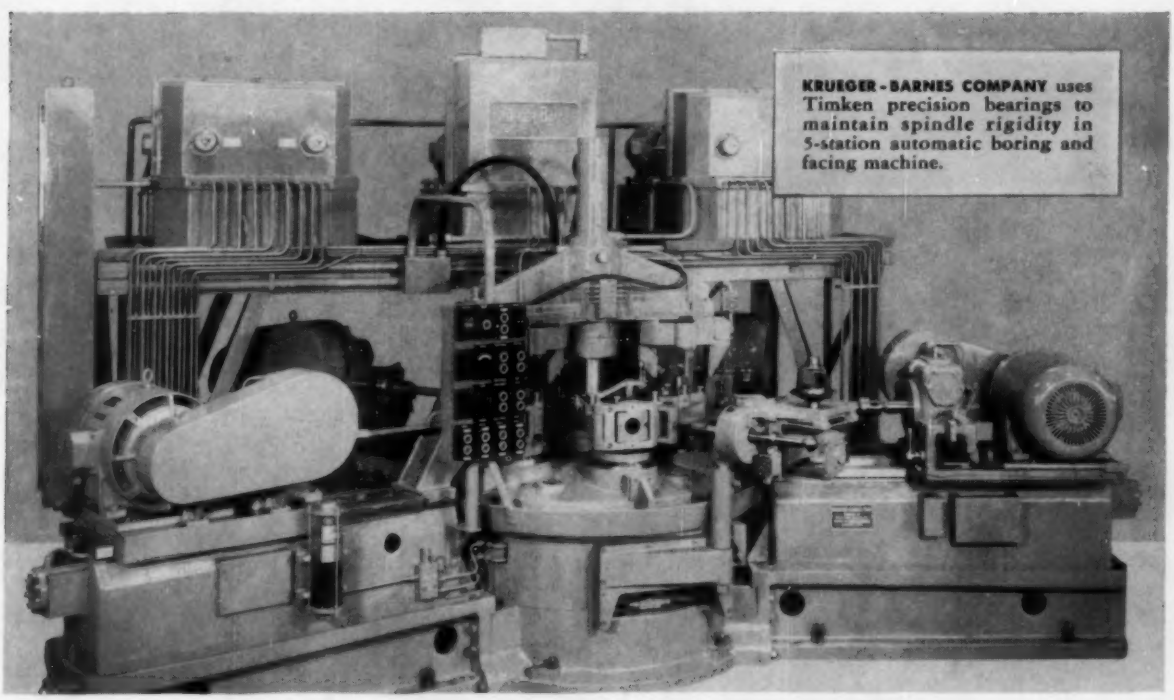

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